

## DIPLOMOVÁ PRÁCE

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AKCE :

PROJEKT STROJNĚ-TECHNOLOGICKÉ ČÁSTI HYDRAULICKÉHO  
OKRUHU LABORATOŘE SPU V NITŘE

OBSAH: HYDROTECHNICKÉ VÝPOČTY HYDRAULICKÉHO OKRUHU -  
TEXTOVÁ ČÁST



FAKULTA  
STAVEBNÍ  
ústav vodních staveb

FORMÁT: A4

DATUM: 01/2021

MĚŘÍTKO: Č. PŘÍLOHY:  
4.1

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# **1 ZÁKLADNÍ INFORMACE**

Název akce: Projekt strojně-technologické části hydraulického okruhu laboratoře SPU v Nitře

Stupeň projektu: Prováděcí projekt

Místo akce: KKI FZKI SPU v Nitře, Hospodárská ul. č.7, par. č. 4582, kat. území Zobor

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Datum odevzdání: leden 2021

## **2 ÚVOD**

Zpracování hydrotechnických výpočtů bylo důležité pro správný návrh jednotlivých částí hydraulického okruhu. Výpočty se týkají posouzení výkonů navržených 3,1 kW čerpadel a tras potrubí od čerpací jímky až k příslušnému měrnému žlabu či připojovacímu bodu. Výpočty zahrnují energetické ztráty třením po délce a ztráty místní.

## **3 POUŽITÉ PODKLADY A PROGRAMY**

Hydrotechnické výpočty byly vypracovány v programu Microsoft Excel. Podkladem pro výpočet byla příloha 5 této diplomové práce, jejíž náhled je pro lepší orientaci uveden na obr. 1. Tato příloha společně s výkresovou částí hydraulického okruhu poskytla geometrický podklad pro snadné a přehledné určení místních ztrát na jednotlivých singularitách i ztrát třením po délce. Z těchto obou příloh je patrné umístění jednotlivých kolen, odboček, šoupátkových uzávěrů, indukčních průtokoměrů, změn světlostí potrubí i ostatních singularit a také potřebné délky jednotlivých potrubí, se kterými bylo následně počítáno. Podkladem pro výpočty byla také odborná literatura uvedená v průvodní zprávě.

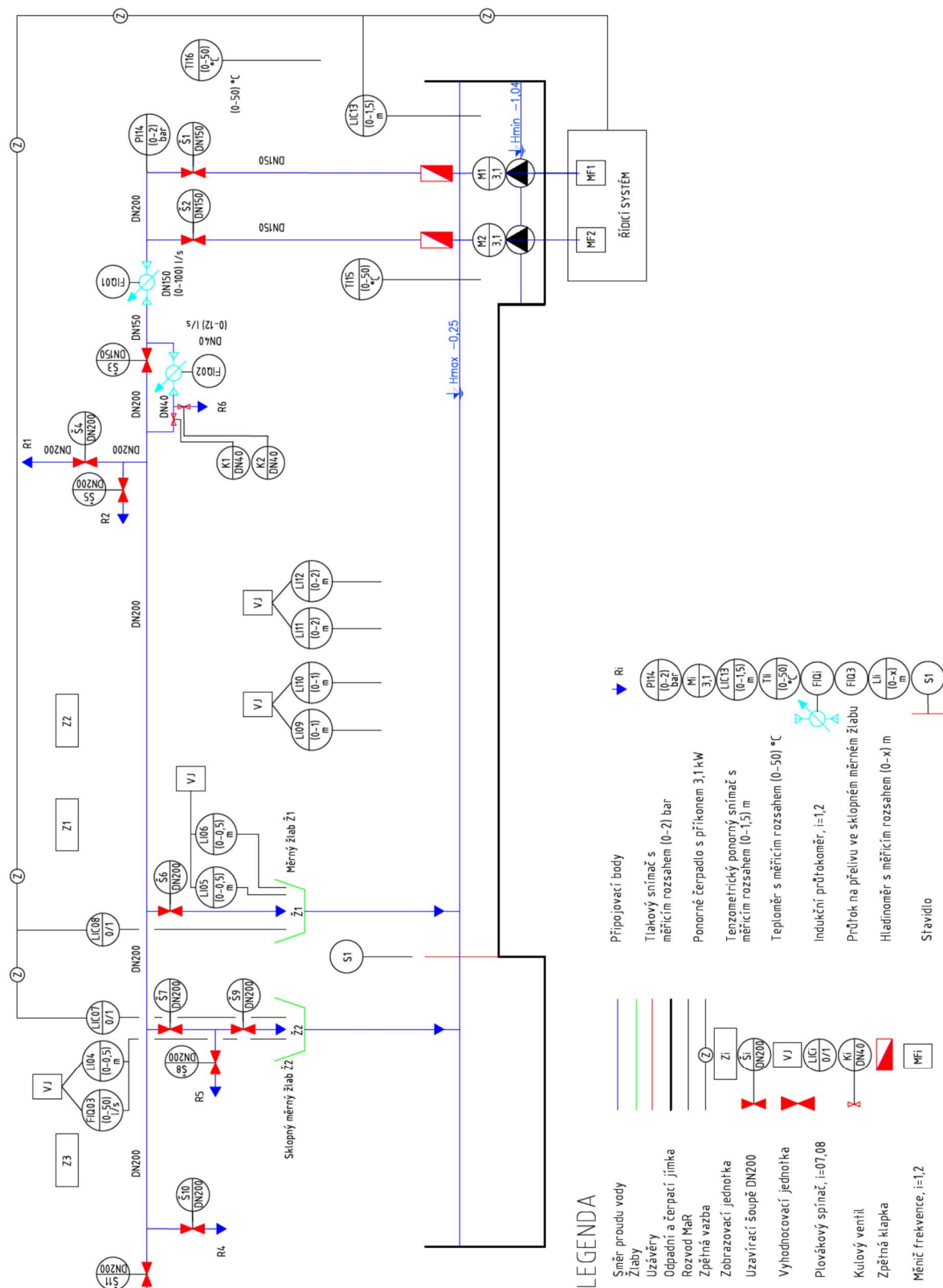
## **4 VÝPOČTOVÁ SCHÉMATA**

V tabulce níže jsou uvedena veškerá výpočtová schémata. Ta představují možnosti průtoku vody k jednotlivým připojovacím bodům či měrným žlabům. Prakticky každý z připojovacích bodů vyjma R6 může být napájen třemi způsoby a má tedy tři výpočtová schémata.

První způsob představuje využití jednoho z čerpadel s tím, že voda bude protékat pouze přes obtok, na kterém je instalován průtokoměr DN 40. Druhý způsob je určen pro velké průtoky, kdy je v provozu pouze jedno z čerpadel a voda protéká přes průtokoměr DN 150. Třetí provozně možný způsob nastává při spuštění obou čerpadel. Zde existuje celá řada způsobů řízení, kdy jedno z čerpadel jede na plný výkon a druhé je v regulaci v závislosti na požadovaném průtoku nebo obě čerpadla jsou řízena shodnou frekvencí otáček jejich motorů. Právě druhý postup je při výpočtech aplikován, byť první způsob bude provozně zřejmě více využíván. Pro určení rozsahu regulace a posouzení maximální kapacity hydraulického systému však tento přístup výpočtu postačuje.

Výpočty byly ve shodné konfiguraci provedeny pro obě čerpadla M1, M2. Vzhledem k tomu, že čerpadla jsou vůči geometrii potrubí prakticky v symetrickém paralelním zapojení,

získané výsledky jsou z hlediska věcné přesnosti shodné. Je tedy možné dosažené výsledky mezi jednotlivými čerpadly M1 a M2 zaměňovat.



Obr. 1 Schéma hydraulického okruhu s vyznačením všech připojovacích bodů

Celkem tedy bylo posouzeno 22 výpočtových schémat průtoku vody hydraulickým okruhem za předpokladu, že voda v akumulární jímce bude na maximální nebo minimální úrovni. V případě měrných žlabů bylo uvažováno s tím, že voda je čerpána buď do maximální konstrukčně možné úrovně nebo minimální možné úrovně. Tyto polohy hladin byly následně sečteny s adekvátními úrovněmi hladin v čerpací jímce tak, abychom obdrželi maximální a minimální hodnoty dopravních výšek. Reálné průtokové a tlakové poměry tak lze očekávat v pásmu mezi těmito extrémy. Přehled výpočtových schémat je patrný z tab. 1.

Tab. 1 Výpočtová schémata

Připojovací bod	Čerpadlo – M1	Čerpadlo – M1	Čerpadlo M1+M2
	Malé průtoky [l/s] obtokem v rozsahu:	Velké průtoky [l/s] v rozsahu:	Velké průtoky [l/s] v rozsahu:
R1	0 – 14	0 – 50	0 – 85
R2	0 – 14	0 – 60	0 – 100
R3	0 – 14	0 – 60	0 – 100
R4	0 – 14	0 – 60	0 – 100
R5	0 – 14	0 – 60	0 – 100
R6	0 – 14	x	x
Měrný žlab Ž1	0 – 14	0 – 60	0 – 100
Měrný žlab Ž2	0 – 14	0 – 60	0 – 100

V každém výpočtovém schématu se nachází řada tabelárních výstupů a finální grafický výstup v podobě dané  $Q-h$  charakteristiky potrubí a čerpadel. Jelikož se v hydraulickém okruhu nachází potrubí více dimenzí, je pro každou z nich (DN 40, DN 50, DN 100, DN 150 a DN 200) vytvořena tabulka, kde je spočtena příslušná ztrátová charakteristika.

## 5 VÝPOČTY ZTRÁT MECHANICKÉ ENERGIE

### 5.1 VÝPOČET ZTRÁT TŘENÍM PO DÉLCE

K určení velikosti ztráty třením po délce byla v hydrotechnických výpočtech použita závislost Darcy – Weisbachova, jež je popsána následující rovnicí:

$$h_t = \lambda \frac{l}{d} \frac{v^2}{2g}, \quad (1)$$

kde  $\lambda$  je součinitel ztrát třením,  $l$  značí příslušnou délku potrubí,  $d$  průměr potrubí,  $g$  tíhové zrychlení a  $v$  je průřezová rychlost v potrubí. Pro každé výpočtové schéma byly stanoveny délky potrubí příslušných dimenzí na základě strojně-technologických výkresů hydraulického okruhu.

Průřezová rychlost byla určena na základě rovnice kontinuity:

$$Q = v S, \quad (2)$$

kde  $S$  je průtočná plocha určena z vnitřního profilu příslušného potrubí.

Vzhledem ke značnému variačnímu rozsahu průtočných množství v systému, od velmi malých průtoků pohybujících se v řádech desetin litrů až po velké průtoky okolo 100 l/s, bude při proudění vody v potrubí docházet jak k vývoji turbulentního, tak i přechodného proudění. Režim proudění lze určit výpočtem velikosti Reynoldsova kritéria dle rovnice:

$$Re = \frac{v d}{\nu}, \quad (3)$$

kde  $v$  je průřezová rychlost v potrubí,  $d$  průměr potrubí a  $\nu$  značí kinematickou viskozitu vody. Ta je závislá na teplotě vody, ve výpočtech byla uvažována teplota vody 19 °C, čemuž odpovídá hodnota viskozity 1,04.E-06 m<sup>2</sup>/s.

Rozsah velikosti Reynoldsova kritéria „ $Re$ “ se pohybuje od několika tisíců (pro velmi malé průtoky a velké průměry potrubí) až po několik set tisíc pro maximální průtoky v systému. S ohledem na tento fakt byl součinitel ztrát třením „ $\lambda$ “ po délce počítán dvěma způsoby.

Pro hodnoty  $Re < 10^5$  byl součinitel ztráty třením  $\lambda$  po délce vyjádřen za pomoci Reynoldsova kritéria ve smyslu Blasiovy rovnice:

$$\lambda = \frac{0,3164}{Re^{0,25}}, \quad (4)$$

K vyjádření ztrátového součinitele v oblasti přechodné a kvadratické byla aplikována Colebrook-Whiteova rovnice:

$$\frac{1}{\sqrt{\lambda}} = -2 \log \left( \frac{2,51}{Re \sqrt{\lambda}} + \frac{\Delta}{3,7d} \right), \quad (5)$$

kde  $\Delta$  značí drsnost potrubí. Na základě použití nerezového potrubí byla uvažována hodnota  $\Delta = 0,3$  mm.

V případě použití implicitního vztahu (4) jsou v jednotlivých sloupcích tabelárních příloh uvedeny vždy výsledky čtyř iteračních kroků s tím, že poslední hodnota je použita pro následné výpočty. V případě využití vztahu (3) nedochází k iteračnímu postupu a ve sloupcích jsou kromě první (startovací) hodnoty uvedeny vždy identické výsledky.

Pro celou škálu rozsahu Reynoldsova kritéria byla kontrolována i podmínka platnosti hydraulické hladkosti potrubí porovnáním tloušťky mezní vrstvy a absolutní velikosti drsnosti potrubí.

## 5.2 VÝPOČET MÍSTNÍCH ZTRÁT

Při deformaci rychlostního pole dochází k energetickým místním ztrátám. To může nastat při změně parametru proudu, ať už náhlé změně průřezu, změně směru, dělením proudu, jeho spojováním, případně v armaturách nebo tvarovkách umístěných na potrubí. Tato místa jsou nazývána singularitami. Velikost místních ztrát byla stanovena dle Weisbacha jako násobek vztažné rychlostní výšky ve smyslu rovnice:

$$h_m = \zeta \frac{v^2}{2g}, \quad (6)$$

kde  $\zeta$  je součinitel místní ztráty příslušné singularity pro vztažný průřez.

Velikosti součinitelů místních ztrát  $\zeta$  byly převzaty z odborné literatury [1], [2], [3]. U všech singularit byla vtažnou rychlostí zvolena ta, která byla stanovena z plochy průtočného průřezu za příslušnou singularitou. Velikost součinitele místních ztrát pro jednotlivé singularity je uvedena v tab. 2.

Tab. 2 Hodnoty součinitelů místní ztráty  $\zeta$

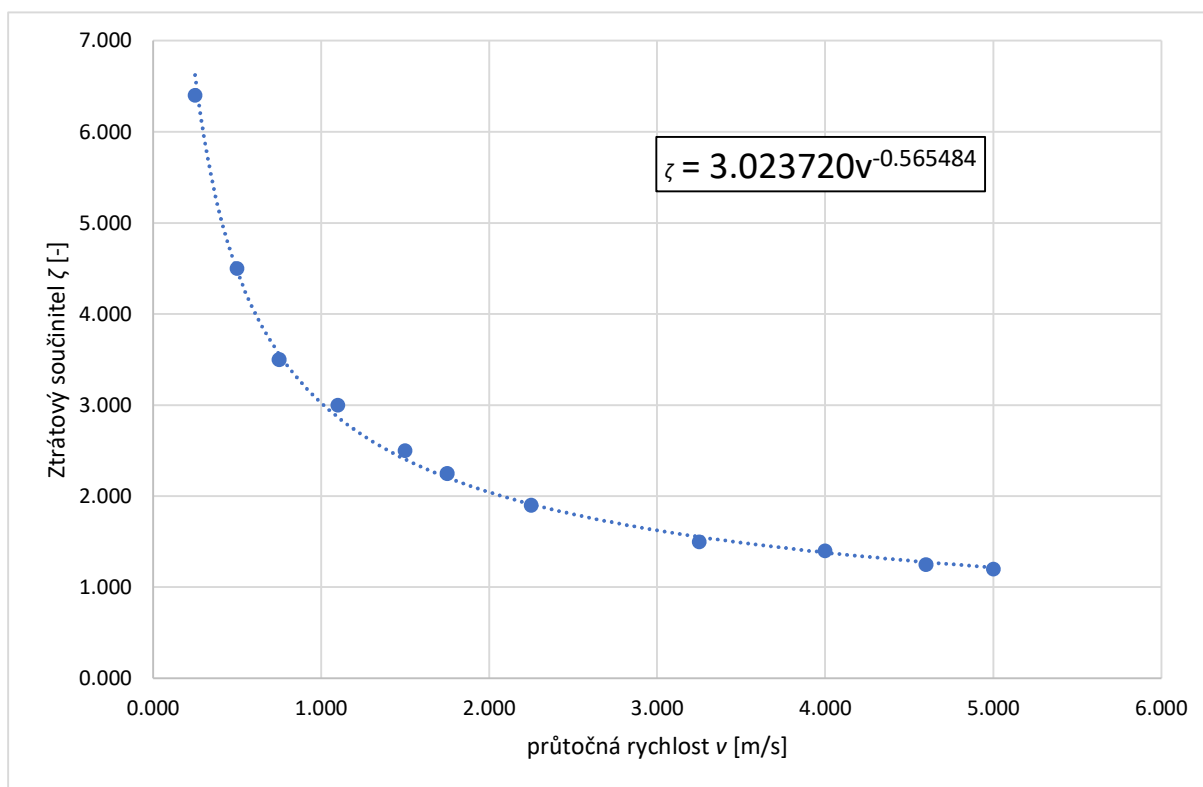
Singularita/průřez	DN40	DN50	DN150	DN200	DN100
Koleno 90°	0.34				
Nožové šoupátko	0.06			0.04	0.06
Rozšíření z DN 150 na DN 200	0.22				
Rozšíření z DN 100 na DN 150	0.56				
Zúžení z DN 200 na DN 150	0.20				
T kus (M1+M2) směr od M1	0.43				
Indukční průtokoměr DN 150	0.10				
Zúžení z DN 50 na DN 40	0.20				
Rozšíření z DN 40 na DN50	0.23				
Kulový ventil	0.10				
Výtok	1.00				
Indukční průtokoměr DN 40	0.10				
Výtok z Bypassu	1.00				
T kus (M1+M2) směr od M2	0.46				
T kus změna směru 90°	1.04				
Pryžový kompenzátor DN200	0.07				
Vtok do Bypassu	0.50				



Ve výše zobrazené tabulce je uvedeno více hodnot ztrátového součinitele u T kusu. Nejčastěji je použita hodnota  $\zeta = 1,04$ , která platí při změně směru proudu o  $90^\circ$  právě v T kusu. Hodnoty  $\zeta = 0,43$  a  $\zeta = 0,46$  nastávají pouze při spuštění obou čerpadel M1 a M2 na jediném T kusu, kde se spojuje proud od obou čerpadel.

V tabelárním výstupu u jednotlivých výpočtových schémat jsou pro větší přehlednost vytvořeny tabulky, ve kterých jsou popsány všechny singularity včetně hodnoty ztrátového součinitele, které přísluší danému schématu.

Pro úplnost je třeba doplnit, že hodnota ztrátového součinitele zpětných klapků instalovaných za oběma čerpadly byla počítána na základě diagramu závislosti ztrátového součinitele na průtočné rychlosti (graf 1) dodaného výrobcem [9].



Graf 1 Diagram závislosti ztrátového součinitele na průtočné rychlosti

## 6 VÝPOČET DOPRAVNÍ VÝŠKY

Pro každý přípojovací bod Ž1, Ž2, R1 – R6 byla počítána maximální a minimální dopravní výška  $h_{max}$ , respektive  $h_{min}$ . Ty jsou závislé na úrovni hladiny v čerpací jímce a poloze příslušného napájecího místa. Jak bylo uvedeno výše, při výpočtových schématech byly uvažovány pouze dvě úrovně hladiny v jímce. Maximální hladina v jímce je na úrovni -0,25 m,

minimální úroveň hladiny pak -1,04 m. Výškové úrovně napájecích míst jsou uvedeny v Tab. 3, přičemž v přípojovacích bodech R1 – R6 bylo uvažováno s jednou hodnotou v ose daného bodu.

Dopravní výšky byly následně určeny jako:

$$h_{max} = h_t + h_m + h_{min,jímka} + h_{max,Ri}, \quad (7)$$

$$h_{min} = h_t + h_m + h_{max,jímka} + h_{min,Ri}. \quad (8)$$

*Tab. 3 úrovně hladiny přípojovacích bodů*

Přípojovací bod	Maximální úroveň hladiny [m]	Minimální úroveň hladiny [m]
Ž1	1.60	1.20
Ž2	2.15	1.79
R1	3.13	
R2	0.59	
R3	0.78	
R4	1.26	
R5	0.78	
R6	0.30	

## 7 ZHODNOCENÍ DOSAŽENÝCH VÝSLEDKŮ A JEJICH VYUŽITÍ PŘI PROVOZU HYDRAULICKÉHO OKRUHU

Výstupem z hydrotechnických výpočtů je řada níže přiložených tabulek a grafů. Pro každý přípojný bod kromě R6, kde se předpokládá průtok pouze obtokem, tak existují sady tabulek a tři výstupní grafy, ze kterých lze odečíst pro maximální a minimální geodetickou výšku příslušné hodnoty předpokládaných pracovních bodů (oblastí) čerpadel.

*Tab. 4 Pracovní body čerpadel*

Přípojovací bod	Čerpadlo – M1 Malé průtoky obtokem [l/s] pro 15 Hz/50Hz	Čerpadlo – M1 Velké průtoky [l/s] pro 15 Hz/50Hz	Čerpadlo M1+M2  Max. průtok [l/s] pro 2 x 50Hz
R1	0,0/11,0	0,0/41,5	75
R2	0,0/13,0	0,0/51,0	92
R3	0,0/12,6	0,0/50,2	90
R4	0,0/12,5	0,0/49,0	88

Připojovací bod	Čerpadlo – M1 Malé průtoky obtokem [l/s] pro 15 Hz/50Hz	Čerpadlo – M1 Velké průtoky [l/s] pro 15 Hz/50Hz	Čerpadlo M1+M2 Max. průtok [l/s] pro 2 x 50Hz
R5	0,0/12,9	0,0/50,0	87
R6	0,0/11,8	x	x
Měrný žlab Ž1	0,0/12,3	0,0/47,7	85
Měrný žlab Ž2	0,0/11,8	0,0/45,0	79

Vzhledem k tomu, že v přehledu jsou uvedeny i průběhy charakteristik čerpadla pro řídicí frekvence nižší než 50 Hz, lze získat celé očekávané pracovní oblasti čerpadel. Kvůli rozsahu tabelárních příloh, je řada tabulek rozdělena koncem stránek, na další stránce se tak nachází vždy pokračování příslušné tabulky. Z výsledků lze vyčíst celou řadu informací, které jsou rozhodné především pro následný provoz hydraulické laboratoře. V případě, kdy se počítalo s nejnepríznivější hodnotou geodetické dopravní výšky a výběrem pracovních bodů pro frekvenci otáčení motoru čerpadla pro 15 Hz a 50 Hz, jsou obdrženy charakteristické pracovní body, jež jsou uvedeny v tab. 4.

Z výsledků lze vyvodit následující závěry. Obě čerpadla bude možné použít od frekvencí vyšších než 15 Hz, což je dobré pro zajištění stability tlakových a průtokových poměrů v hydraulickém okruhu. Pokud by bylo třeba v některých případech čerpat množství menší, než odpovídá frekvenci 15 Hz, je možné provést předregulaci (přiškrcení) některým z nožových šoupátek či kulových ventilů.

Při průtoku přes obtok a magneticko-indukční průtokoměr DN 40 lze u všech připojovacích bodů garantovat průtoky dosahující 11 l/s. Pro úplnost je třeba podotknout, že například napojením hadice DN 50 na připojovací bod R6 budou očekávatelné průtoky menší, odpovídající energetickým ztrátám v připojené hadici.

Při provozu jednoho z čerpadel přes magneticko-indukční průtokoměr DN 150 lze maximální hodnoty průtoku očekávat okolo 50 l/s. To je limitní hodnota platící prakticky i pro oba měrné žlaby Ž1 a Ž2 a odpovídající současně jejich maximální průtočné kapacitě. Nepředpokládáme, že do měrných žlabů bude dopravováno množství větší než 50 l/s, byť to je reálně v ojedinělých případech možné. Z provozního hlediska je třeba na tuto skutečnost pamatovat.

Za provozu obou čerpadel při jejich maximálních otáčkách motoru lze očekávat hodnoty průtoku pro většinu připojovacích bodů okolo 90 l/s. Pouze u bodu R1 je hodnota nižší a činí 75 l/s.

Ze získaných výsledků lze také usuzovat na doporučený způsob volby průtoku přes průtokoměr DN 150 nebo přes průtokoměr DN 40 instalovaný na obtoku. Oba průtokoměry lze spolehlivě využít při rychlostech větších než 0,2 m/s. Pokud budeme uvažovat hodnotu minimální rychlosti výrazně větší z pohledu bezpečného zajištění správnosti měření okolo 0,4 m/s, lze průtokoměrem DN 40 měřit průtoky od 0,5 l/s, průtokoměrem DN 150 lze bezpečně registrovat průtoky již od 7 l/s. Z těchto údajů tak lze stanovit jednoznačnou provozní zásadu. V případě, že bude třeba měřit průtoky menší než 7 l/s použije se pro měření obtok, v případě průtoků vyšších se použije pro stanovení průtoku průtokoměr DN 150.

Tahle hraniční hodnota se pro různé připojovací body však může měnit, takže je na uživateli, aby s těmito informacemi vědomě pracoval. Prakticky lze postupovat tak, že pokud se bude měřit průtok menší než 11 l/s použije se obtok, pokud však nebude dosaženo požadované kapacity, obtok se uzavře a zvolí se průtok hlavním průtokoměrem DN 150, který průtoky pod 11 l/s je schopen korektním způsobem zaznamenat.

Díky tomuto průtokovému „překryvu“ a způsobu sériovému zapojení průtokoměrů, lze průtokoměry dokonce vzájemně kontrolovat a velmi rychle tak zjistit, zda nedošlo k selhání jejich měřicí schopnosti.

Doporučení pro provoz největších průtoků při chodu obou čerpadel je následující. Nejčastěji se využije postupu, který byl zmíněn již výše. Jedno z čerpadel jede na plný výkon a druhé je v ruční regulaci podle požadovaného průtoku. Pro překonání některých hraničních průtoků je taktéž možné jedno z čerpadel spustit na snížené otáčky motoru, jež odpovídají např. 40 Hz a druhé čerpadlo provozovat v regulaci. Nabízí se samozřejmě i řízení čerpadel se shodnými řídicími frekvencemi motoru čerpadel.

## **8 ZÁVĚR**

Předložené hydrotechnické výpočty se zabývají velikostí celkových ztrát mechanické energie v trubním systému hydraulického okruhu. Hydrotechnické výpočty sloužily při návrhu obou čerpadel a posouzení tlakových a proudových poměrů v jednotlivých částech hydraulického okruhu. Součástí výpočtů bylo i nalezení vnitřního průměru potrubí

a příslušného průtokoměru instalovaného na obtoku tak, aby došlo k dostatečnému „překryvu“ průtoků, které je možno za pomoci obou průtokoměrů zaznamenat. Z výsledků lze získat v rozsahu doporučených řídicích frekvencí motorů čerpadel v rozsahu (15 – 50) Hz pracovní oblasti pro jednotlivé připojovací body. Výsledky výpočtů je možné využít při připojování různých modelů hydrotechnických staveb k příslušným připojovacím bodům.

Je třeba zdůraznit, že se výsledky z předložených hydrotechnických výpočtů mohou mírně odlišovat od skutečnosti, jako i výstupní pracovní oblasti navržených čerpadel spolu s limitním průtokem 11 l/s, při němž je možné změnit průtočnou trasu (DN 40 nebo DN 150). Je zřejmé, že při skutečném proudění navrženým trubním systémem, se budou jednotlivé singularity vzájemně ovlivňovat. Jsou řazeny poměrně blízko za sebou a nelze tak zcela korektně určit velikost celkové energetické ztráty v systému. Nejpravděpodobněji tak bude součet vypočtených energetických ztrát na jednotlivých singularitách vyšší než ztráty skutečné. Toto je však ve prospěch kapacity hydraulického okruhu. Na polohu pracovních bodů a pracovních oblastí příslušných čerpadel má samozřejmě také vliv množství, resp. úroveň vody v akumulární jímce. Také poloha hladiny připojeného modelu bude mít dopad na maximální průtokovou kapacitu dané trasy. Z výše jmenovaných důvodů budou veškeré limitní parametry stanoveny v průběhu zkušebního provozu hydraulického okruhu. Již při spuštění je tak třeba zajistit, aby byly minimálně dva přípojné body připraveny k využití a mohly tak být stanoveny pravděpodobnější hodnoty příslušných parametrů.

## DIPLOMOVÁ PRÁCE

VYPRACOVAL :	Bc. DANIEL BOHÁČ	
VEDOUCÍ PRÁCE:	Ing. MICHAL ŽOUŽELA, Ph.D.	
VEDOUCÍ ÚSTAVU:	Prof. Ing. JAN ŠULC, CSc.	

AKCE :

PROJEKT STROJNĚ-TECHNOLOGICKÉ ČÁSTI HYDRAULICKÉHO  
OKRUHU LABORATOŘE SPU V NITŘE

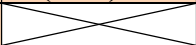
OBSAH: HYDROTECHNICKÉ VÝPOČTY HYDRAULICKÉHO OKRUHU -  
TABELÁRNÍ A GRAFICKÉ VÝSTUPY



FAKULTA  
STAVEBNÍ  
ústav vodních staveb

FORMÁT:	A4
DATUM:	01/2021
MĚŘÍTKO:	Č. PŘÍLOHY: 4.2

## Směr čerpaného množství a použitá čerpadla

	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-50) l/s	(0-85) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

L <sub>DN200</sub>	4.050	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.474	m
L <sub>DN40</sub>	0.634	m

Rozsah průtoků v připojovacím bodě:

R1 - Malé průtoky (0-14) l/s

Čerpadlo - ČM1

Singularity	ζ				
	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.2	
Indukční průtokoměr DN 150				0.1	
T kus změna směru 90°					1.040
Nožové šoupátko					0.04
Koleno 90°					0.34
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
Σ	0.400	2.414	0.340	1.263	2.678

**Potrubí DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.0425	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.0358	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.0323	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.0301	0.000	0.001
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.0272	0.000	0.001
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.0262	0.000	0.002
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.0253	0.000	0.002
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.0246	0.001	0.003
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.003
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.0234	0.001	0.004
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.0229	0.001	0.005
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.0224	0.001	0.006
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.0220	0.001	0.007
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.001	0.008
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.0213	0.001	0.009
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.0210	0.002	0.010
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.0207	0.002	0.011
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.0204	0.002	0.012
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.014
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.0196	0.002	0.017
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.0192	0.003	0.020
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.0188	0.003	0.023
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.0185	0.004	0.027

**Potrubí DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.0396	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.0333	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.0301	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.0280	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.0253	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.0243	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.0235	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.0229	0.001	0.026
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.030
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.0217	0.001	0.035



Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.0213	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.0209	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.0205	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.0198	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.0195	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.0192	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.0190	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.0183	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.0179	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.0250	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.0249	0.009	0.151

#### Potrubí DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.0310	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.0261	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.0235	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.0219	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.0207	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.0198	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.0191	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.0184	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.0179	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.0318	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.0317	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.0317	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.0316	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.0316	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.0315	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.0315	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.0315	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.0314	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.0314	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.0314	0.217	1.985
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.0313	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.0313	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.0313	0.366	3.355
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.0313	0.424	3.890

**Potrubí DN40**

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.15 3	408809	0.040	0.034	0.034	0.034	2.715	2.102

**Potrubí DN100**

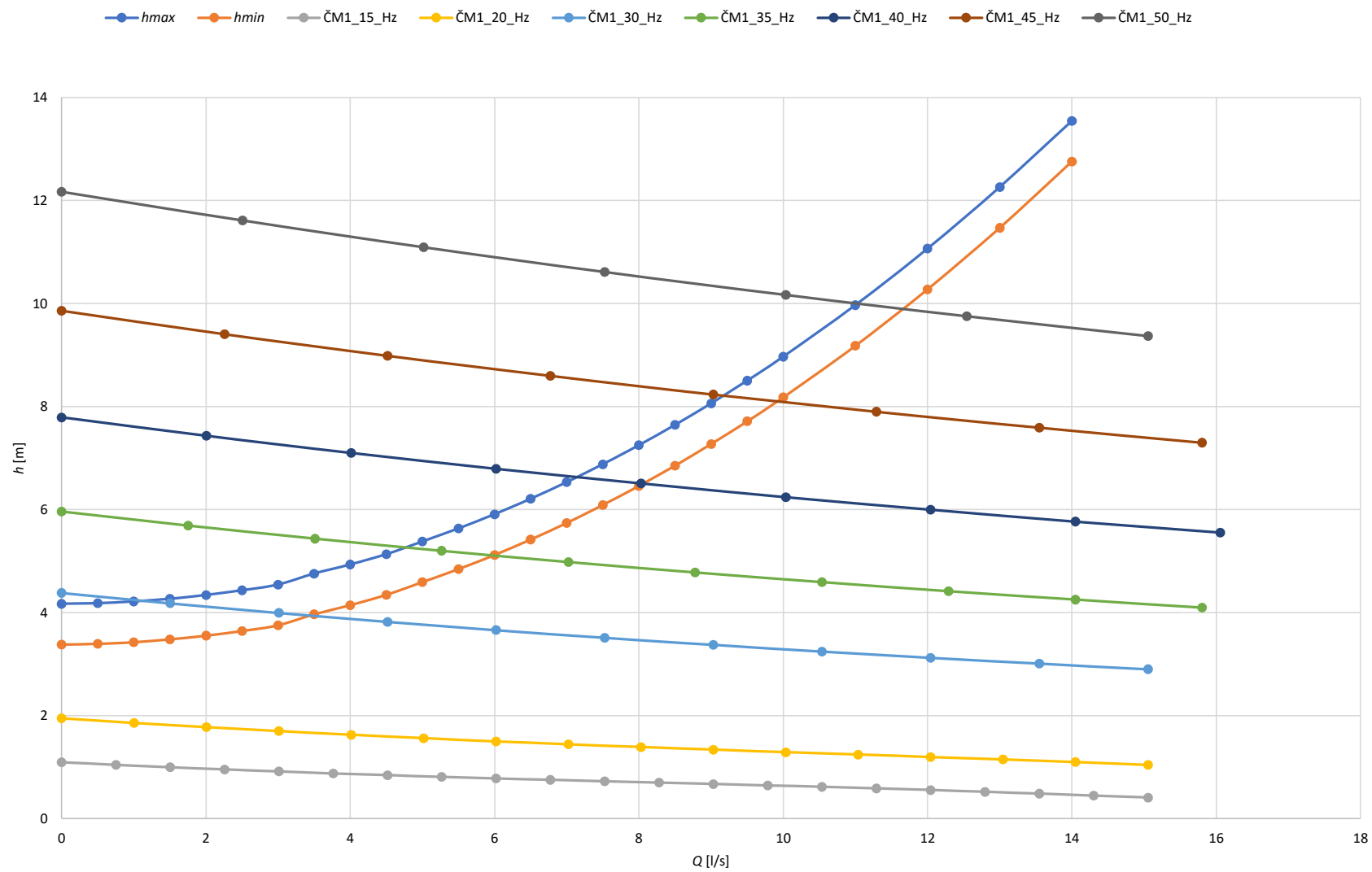
Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0.000	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008
6.0	0.006	0.764	0.010

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

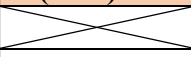
#### Výsledná tabulka

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0.000	0.000	4.171	3.381
0.5	0.0005	0.003	0.009	4.183	3.393
1	0.001	0.012	0.034	4.216	3.426
1.5	0.0015	0.024	0.075	4.269	3.479
2	0.002	0.039	0.132	4.342	3.552
2.5	0.0025	0.058	0.204	4.433	3.643
3	0.003	0.080	0.293	4.544	3.754
3.5	0.0035	0.189	0.397	4.757	3.967
4	0.004	0.246	0.517	4.934	4.144
4.5	0.0045	0.310	0.653	5.134	4.344
5	0.005	0.406	0.805	5.382	4.592
5.5	0.0055	0.491	0.973	5.634	4.844
6	0.006	0.583	1.156	5.910	5.120
6.5	0.0065	0.684	1.355	6.209	5.419
7	0.007	0.792	1.570	6.532	5.742
7.5	0.0075	0.909	1.800	6.879	6.089
8	0.008	1.033	2.046	7.250	6.460
8.5	0.0085	1.166	2.308	7.644	6.854
9	0.009	1.306	2.586	8.062	7.272
9.5	0.0095	1.454	2.879	8.504	7.714
10	0.01	1.611	3.188	8.969	8.179
11	0.011	1.947	3.853	9.971	9.181
12	0.012	2.316	4.581	11.068	10.278
13	0.013	2.719	5.372	12.261	11.471
14	0.014	3.152	6.225	13.547	12.757

Q-h charakteristika potrubí a čerpadel "ČM1-R1" (0-14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-50) l/s	(0-85) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

$L_{DN\ 200}$	4.050	m
$L_{DN\ 150}$	1.901	m

### Rozsah průtoků v připojovacím bodě:

R1 - Velké průtoky (0-50) l/s

Čerpadlo - ČM1

	$\zeta$				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.2	
Indukční průtokoměr DN 150				0.1	
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.04
Nožové šoupátko					0.040
Koleno 90°					0.340
$\Sigma$	0	0	0.340	1.323	2.896

**Potrubí DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.004
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.001	0.008
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.015
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.003	0.023
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.004	0.034
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.008	0.046
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.010	0.060
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.012	0.076
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.015	0.093
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.018	0.113
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.022	0.135
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.025	0.158
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.029	0.183
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.033	0.210
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.038	0.239
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.043	0.270
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.048	0.303
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.053	0.337
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.059	0.374

**Potrubí DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225

Potrubí  
DN100

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702

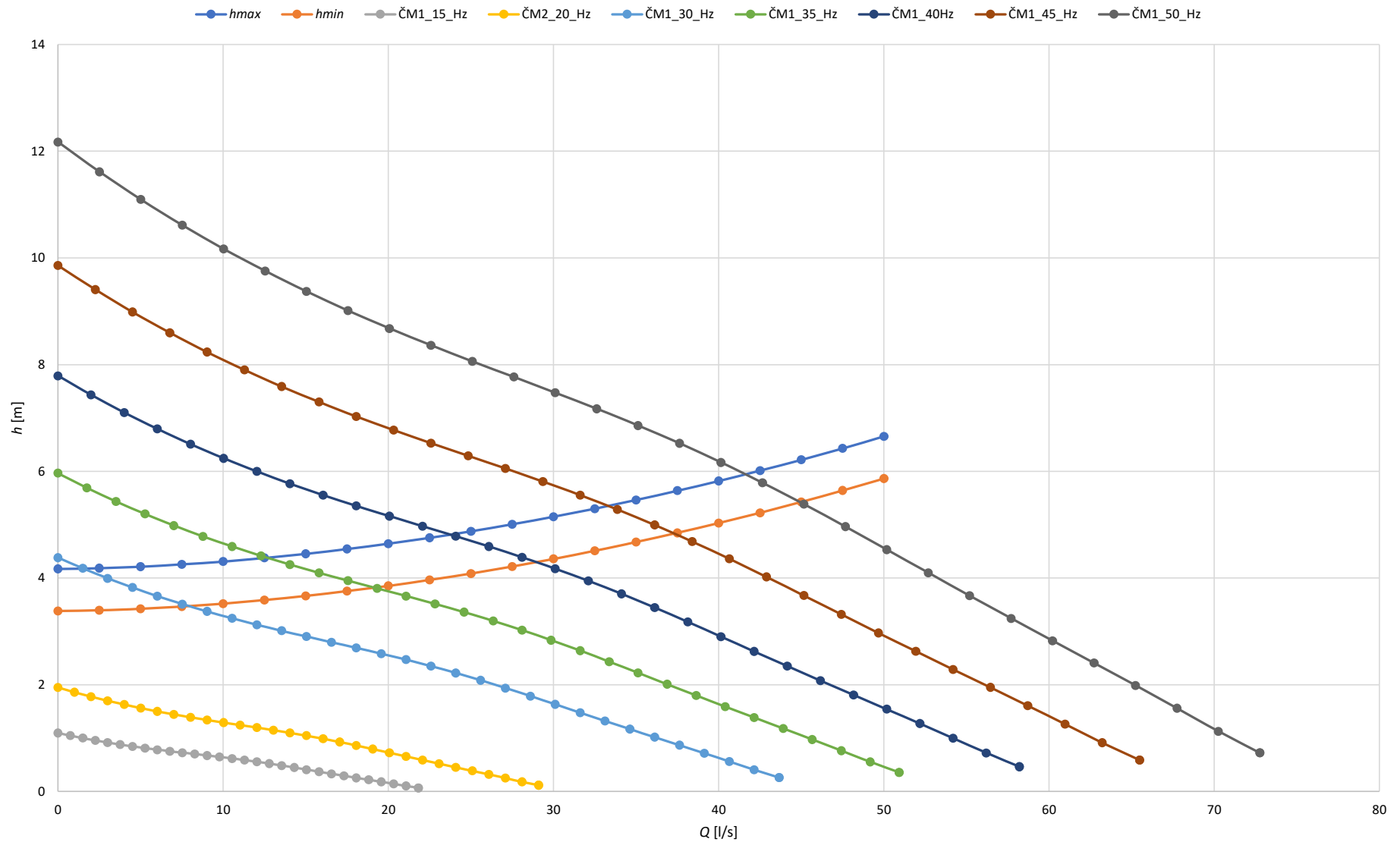
#### Výsledná tabulka

Q	Q	$\Sigma h_t$	$\Sigma h_m$	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	4.171	3.381
2.5	0.003	0.001	0.013	4.184	3.394
5.0	0.005	0.002	0.041	4.214	3.424
7.5	0.008	0.004	0.081	4.256	3.466
10.0	0.010	0.006	0.133	4.309	3.519
12.5	0.013	0.011	0.195	4.377	3.587
15.0	0.015	0.016	0.267	4.454	3.664
17.5	0.018	0.023	0.350	4.544	3.754
20.0	0.020	0.030	0.443	4.643	3.853

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
22.5	0.023	0.038	0.545	4.754	3.964
25.0	0.025	0.047	0.657	4.875	4.085
27.5	0.028	0.056	0.779	5.006	4.216
30.0	0.030	0.067	0.911	5.148	4.358
32.5	0.033	0.078	1.052	5.300	4.510
35.0	0.035	0.090	1.203	5.463	4.673
37.5	0.038	0.103	1.362	5.636	4.846
40.0	0.040	0.117	1.532	5.819	5.029
42.5	0.043	0.132	1.710	6.013	5.223
45.0	0.045	0.148	1.898	6.216	5.426
47.5	0.048	0.165	2.095	6.430	5.640
50.0	0.050	0.182	2.301	6.654	5.864



Q-h charakteristika potrubí a čerpadel "ČM1-R1" - velké průtoky



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-50) l/s	(0-85) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

**R1 - Velké průtoky (0-85) l/s**

**Čerpadlo: ČM1+ČM2**

ČM1			
Singularity	DN100	DN150	DN200
Koleno 90°	0.340		
Rozšíření z DN 100 na DN 150		0.563	
Koleno 90°		0.340	
Nožové šoupátko		0.060	
Rozšíření z DN 150 na DN 200			0.218
T kus změna směru 90°			1.040
T kus (M1+M2) směr od M1			0.430
Σ	0.340	0.963	1.688
ČM2			
Singularity	DN100	DN150	DN200
Koleno 90°	0.340		
Rozšíření z DN 100 na DN 150		0.563	
Koleno 90°		0.340	
Nožové šoupátko		0.060	
Rozšíření z DN 150 na DN 200			0.218
T kus (M1+M2) směr od M2			0.460
Σ	0.340	0.963	0.678

ČM1+ČM2			
Singularity	DN100	DN150	DN200
Zúžení z DN 200 na DN 150		0.200	
Indukční průtokoměr DN 150		0.100	
Nožové šoupátko		0.06	
Rozšíření z DN 150 na DN 200			0.218
T kus změna směru 90°			1.04
Nožové šoupátko			0.040
Koleno 90°			0.340
$\Sigma$	0.000	0.360	1.638
DÉLKY ČM1		DÉLKY ČM2	
L <sub>DN200</sub>	0.244 m	L <sub>DN200</sub>	4.398 m
L <sub>DN150</sub>	0.699 m	L <sub>DN150</sub>	1.202 m

#### Potrubí DN200

ČM1									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.001
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.002
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.005
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.009
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.014
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.020
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.027
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.001	0.035
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.001	0.044
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.001	0.054
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.001	0.066
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.001	0.078
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.002	0.092
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.002	0.107
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.002	0.123
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.002	0.139
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.003	0.157

ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.000
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.001
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.002

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.004
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.005
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.008
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.011
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.000	0.014
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.000	0.018
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.000	0.022
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.000	0.026
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.000	0.032
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.000	0.037
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.000	0.043
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.000	0.049
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.000	0.056
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.000	0.063
<b>ČM1+ČM2</b>									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.001	0.002
10	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.002	0.008
15	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.005	0.019
20	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.011	0.034
25	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.016	0.053
30	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.023	0.076
35	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.032	0.104
40	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.041	0.135
45	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.052	0.171
50	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.064	0.211
55	0.055	1.751	336464	0.040	0.022	0.022	0.022	0.077	0.256
60	0.060	1.910	367052	0.040	0.022	0.022	0.022	0.091	0.304
65	0.065	2.069	397639	0.040	0.022	0.022	0.022	0.107	0.357
70	0.070	2.228	428227	0.040	0.022	0.022	0.022	0.124	0.414
75	0.075	2.387	458815	0.040	0.022	0.022	0.022	0.142	0.476
80	0.080	2.546	489402	0.040	0.022	0.022	0.022	0.161	0.541
85	0.085	2.706	519990	0.040	0.022	0.022	0.022	0.182	0.611

**Potrubí DN150**

<b>ČM1</b>									
Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
<b>ČM2</b>									
Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826

ČM1+ČM2									
Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.001	0.001
10	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.002	0.006
15	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.007	0.013
20	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.013	0.024
25	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.020	0.037
30	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.028	0.053
35	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.039	0.072
40	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.050	0.094
45	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.063	0.119
50	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.078	0.147
55	0.055	3.112	448619	0.040	0.024	0.024	0.024	0.094	0.178
60	0.060	3.395	489402	0.040	0.024	0.024	0.024	0.112	0.212
65	0.065	3.678	530186	0.040	0.024	0.024	0.024	0.131	0.248
70	0.070	3.961	570969	0.040	0.024	0.024	0.024	0.152	0.288
75	0.075	4.244	611753	0.040	0.024	0.024	0.024	0.175	0.331
80	0.080	4.527	652536	0.040	0.024	0.024	0.024	0.198	0.376
85	0.085	4.810	693320	0.040	0.024	0.024	0.024	0.224	0.425

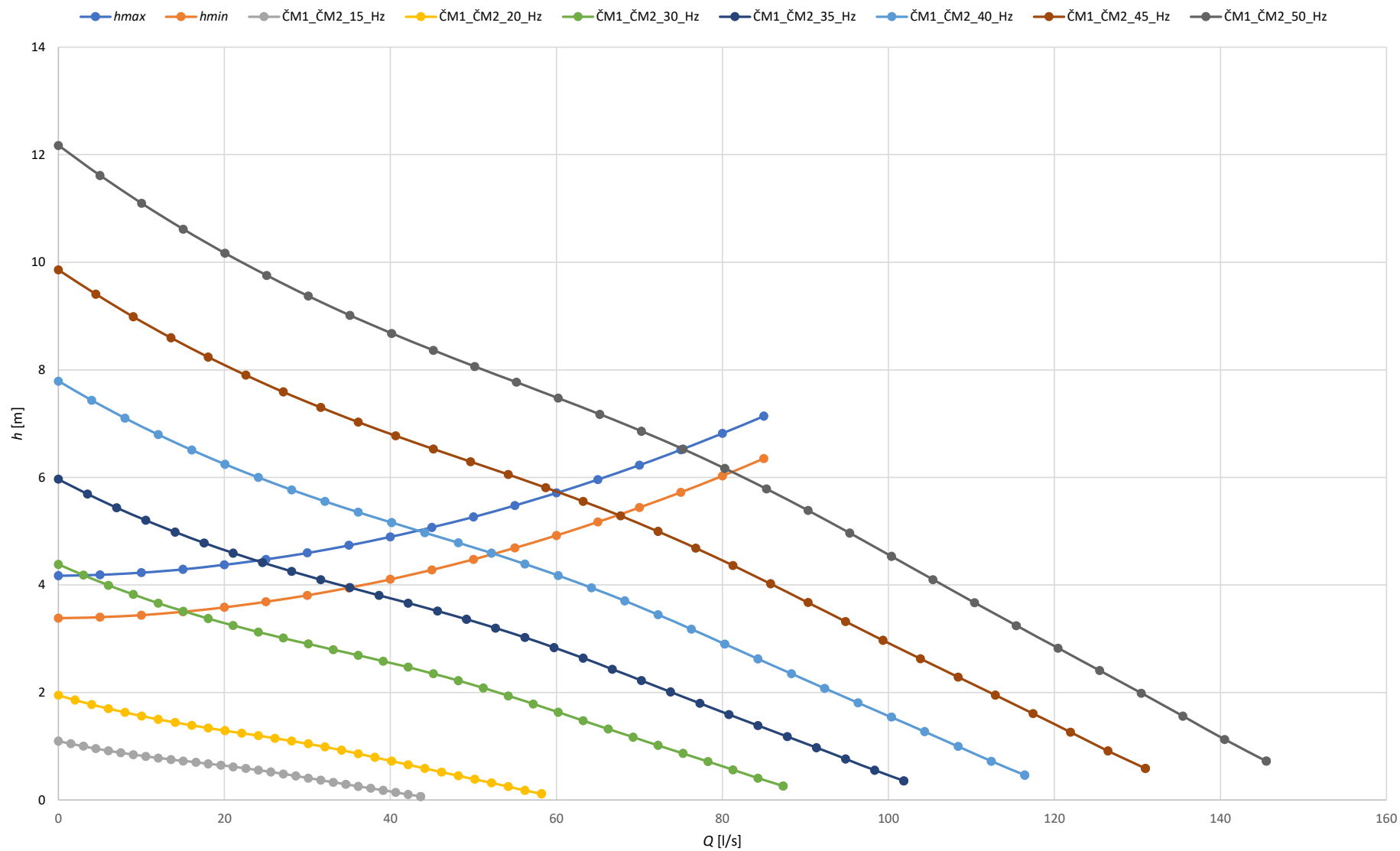
#### Potrubí DN100

ČM1				ČM2				ČM1+ČM2			
Q	Q	v <sub>40</sub>	h <sub>m100</sub>	Q	Q	v <sub>40</sub>	h <sub>m100</sub>	Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]	[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]	[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.002	5	0.005	0.637	0
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.007	10	0.010	1.273	0
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.016	15	0.015	1.910	0
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.028	20	0.020	2.546	0
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.044	25	0.025	3.183	0
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.063	30	0.030	3.820	0
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.086	35	0.035	4.456	0
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.112	40	0.040	5.093	0
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.142	45	0.045	5.730	0
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.176	50	0.050	6.366	0
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.212	55	0.055	7.003	0
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.253	60	0.060	7.639	0
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.297	65	0.065	8.276	0
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.344	70	0.070	8.913	0
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.395	75	0.075	9.549	0
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.449	80	0.080	10.186	0
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.507	85	0.085	10.823	0

### Výsledná tabulka

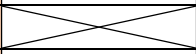
Q	Q	$\sum h_t$	$\sum h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0.000	0	4.171	3.381
5	0.005	0.002	0.016	4.188	3.398
10	0.010	0.005	0.053	4.228	3.438
15	0.015	0.013	0.107	4.290	3.500
20	0.020	0.025	0.178	4.374	3.584
25	0.025	0.039	0.265	4.475	3.685
30	0.030	0.056	0.369	4.596	3.806
35	0.035	0.076	0.488	4.735	3.945
40	0.040	0.099	0.623	4.893	4.103
45	0.045	0.125	0.774	5.070	4.280
50	0.050	0.154	0.940	5.265	4.475
55	0.055	0.186	1.121	5.478	4.688
60	0.060	0.221	1.318	5.710	4.920
65	0.065	0.259	1.530	5.959	5.169
70	0.070	0.300	1.756	6.227	5.437
75	0.075	0.344	1.998	6.513	5.723
80	0.080	0.391	2.255	6.817	6.027
85	0.085	0.441	2.527	7.139	6.349

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-R1" (0-85) l/s





## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

L <sub>DN200</sub>	0.832	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.474	m
L <sub>DN40</sub>	0.634	m

**Rozsah průtoků v připojovacím bodě:**

**R2 - Malé průtoky (0-14) l/s**

**Čerpadlo - ČM1**

	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
T kus změna směru 90°					1.04
T kus změna směru 90°					1.04
Nožové šoupátko					0.040
Σ	0.400	2.414	0.340	1.263	3.378

**Potrubí DN200**

Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.043	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.036	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.032	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.030	0.000	0.001
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.028	0.000	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.027	0.000	0.002
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.026	0.000	0.002
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.025	0.000	0.003
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.025	0.000	0.004
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.024	0.000	0.004
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.023	0.000	0.005
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.023	0.000	0.006
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.022	0.000	0.007
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.022	0.000	0.009
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.022	0.000	0.010
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.021	0.000	0.011
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.021	0.000	0.013
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.021	0.000	0.014
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.020	0.000	0.016
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.020	0.000	0.017
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.020	0.001	0.021
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.019	0.001	0.025
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.019	0.001	0.029
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.018	0.001	0.034

Q	Q	$v_{150}$	$Re_{150}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.040	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.033	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.030	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.028	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.026	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.025	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.024	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.024	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.023	0.001	0.026

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.022	0.001	0.030
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.022	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.021	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.021	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.020	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.020	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.020	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.019	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.019	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.019	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.019	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.018	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.018	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.025	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.025	0.009	0.151

#### Potrubí DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.031	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.026	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.024	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.022	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.021	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.020	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.019	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.018	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.018	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.032	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.032	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.032	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.032	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.032	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.032	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.031	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.031	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.031	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.031	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.031	0.217	1.985

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.031	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.031	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.031	0.366	3.355
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.031	0.424	3.890

#### Potrubi DN40

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.715	2.102

#### Potrubi DN100

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002

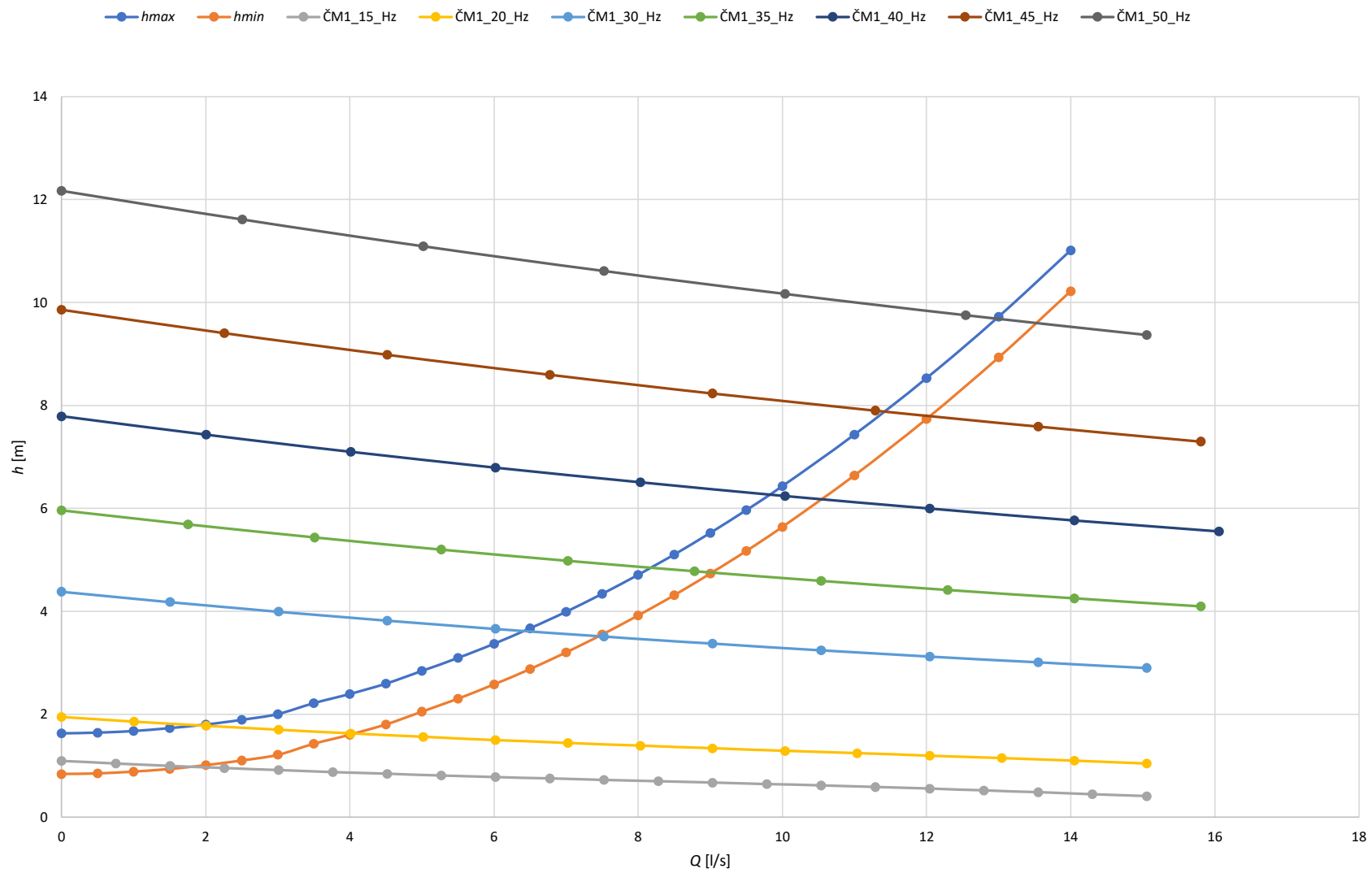
Q	Q	V <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

#### Výsledná tabulka

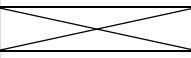
Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0.000	0.000	0.000	1.630	0.840
0.5	0.001	0.003	0.009	1.642	0.852
1	0.001	0.012	0.034	1.675	0.885
1.5	0.002	0.024	0.075	1.729	0.939
2	0.002	0.039	0.132	1.801	1.011
2.5	0.003	0.058	0.205	1.893	1.103
3	0.003	0.080	0.293	2.003	1.213
3.5	0.004	0.189	0.398	2.217	1.427
4	0.004	0.246	0.518	2.394	1.604
4.5	0.005	0.310	0.654	2.594	1.804
5	0.005	0.406	0.806	2.842	2.052
5.5	0.006	0.490	0.974	3.094	2.304
6	0.006	0.583	1.157	3.370	2.580
6.5	0.007	0.683	1.356	3.669	2.879
7	0.007	0.791	1.571	3.993	3.203
7.5	0.008	0.908	1.802	4.340	3.550
8	0.008	1.032	2.048	4.711	3.921
8.5	0.009	1.164	2.311	5.105	4.315
9	0.009	1.305	2.588	5.523	4.733

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
9.5	0.010	1.453	2.882	5.965	5.175
10	0.010	1.609	3.191	6.431	5.641
11	0.011	1.946	3.857	7.433	6.643
12	0.012	2.314	4.586	8.530	7.740
13	0.013	2.716	5.378	9.724	8.934
14	0.014	3.149	6.232	11.011	10.221

Q-h charakteristika potrubí a čerpadel "ČM1-R2" (0-14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

L <sub>DN200</sub>	1.548	m
L <sub>DN150</sub>	1.901	m

Rozsah průtoků v připojovacím bodě:

**R2 - Velké průtoky (0-60) l/s**

**Čerpadlo - ČM1**

	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Nožové šoupátko					0.04
T kus změna směru 90°					1.040
Σ	0.000	0.000	0.340	1.323	3.596



**Potrubí DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.005
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.010
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.019
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.001	0.029
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.002	0.042
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.003	0.057
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.004	0.074
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.005	0.094
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.006	0.116
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.007	0.140
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.008	0.167
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.010	0.196
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.011	0.227
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.013	0.261
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.014	0.297
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.016	0.335
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.018	0.376
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.020	0.419
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.022	0.464
52.5	0.053	1.671	321170	0.0400	0.0222	0.0224	0.0224	0.025	0.512
55.0	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.027	0.562
57.5	0.058	1.830	351758	0.0400	0.0222	0.0224	0.0224	0.030	0.614
60.0	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.032	0.668

**Potrubí DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225
52.5	0.053	2.971	428227	0.0400	0.0238	0.0238	0.0238	0.136	1.330
55.0	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.149	1.439
57.5	0.058	3.254	469011	0.0400	0.0237	0.0238	0.0238	0.163	1.551
60.0	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.177	1.667

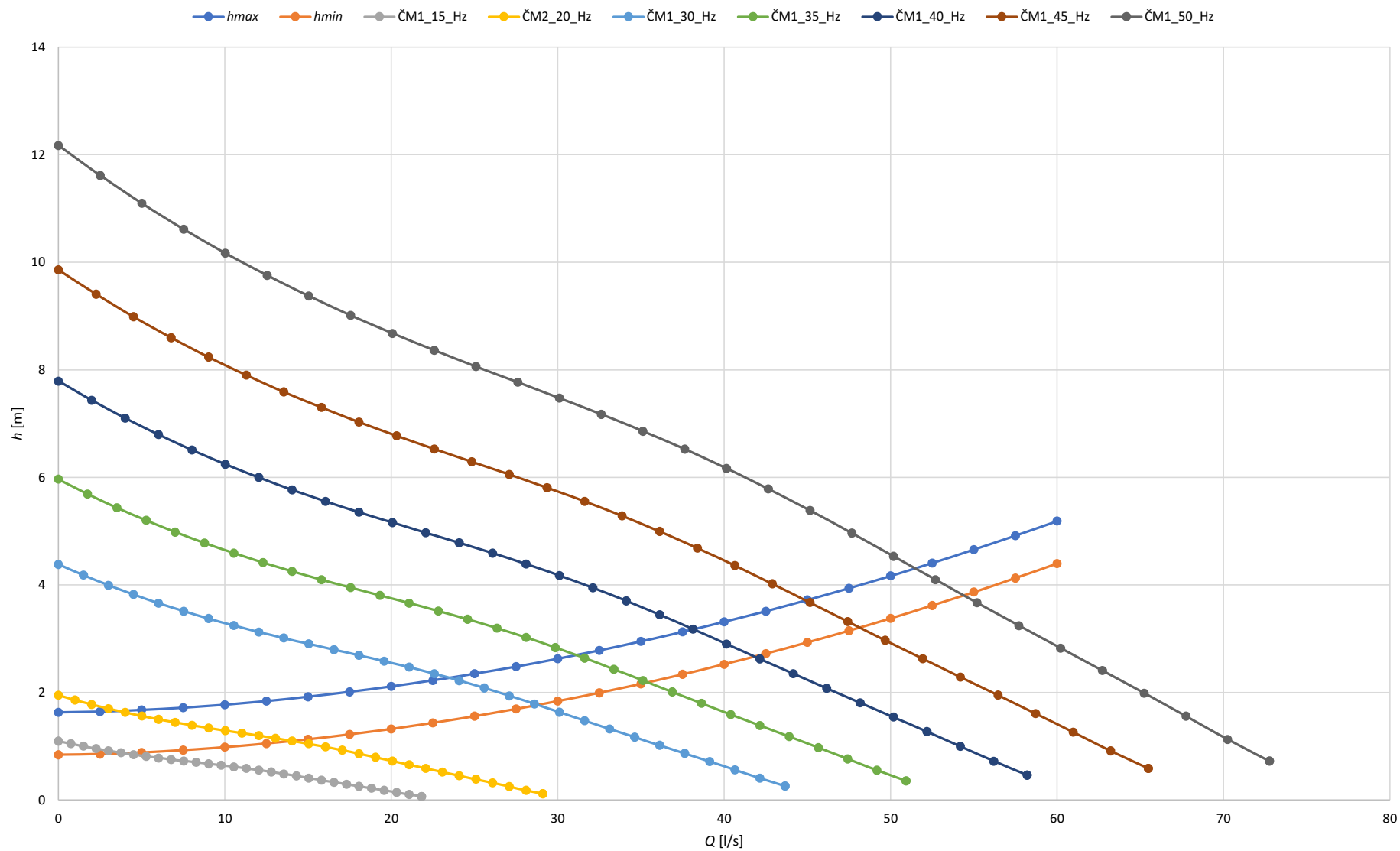
#### Potrubí DN100

Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702
52.5	0.053	6.685	0.774
55.0	0.055	7.003	0.850
57.5	0.058	7.321	0.929
60.0	0.060	7.639	1.011

### Výsledná tabulka

Q	Q	$\sum h_t$	$\sum h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	1.630	0.840
2.5	0.003	0.000	0.014	1.644	0.854
5.0	0.005	0.001	0.042	1.674	0.884
7.5	0.008	0.003	0.083	1.716	0.926
10.0	0.010	0.005	0.136	1.771	0.981
12.5	0.013	0.009	0.200	1.840	1.050
15.0	0.015	0.013	0.275	1.919	1.129
17.5	0.018	0.018	0.361	2.009	1.219
20.0	0.020	0.024	0.457	2.111	1.321
22.5	0.023	0.030	0.563	2.224	1.434
25.0	0.025	0.037	0.680	2.347	1.557
27.5	0.028	0.045	0.807	2.482	1.692
30.0	0.030	0.053	0.943	2.627	1.837
32.5	0.033	0.062	1.090	2.782	1.992
35.0	0.035	0.072	1.247	2.949	2.159
37.5	0.038	0.083	1.413	3.126	2.336
40.0	0.040	0.094	1.589	3.313	2.523
42.5	0.043	0.106	1.775	3.511	2.721
45.0	0.045	0.118	1.971	3.719	2.929
47.5	0.048	0.132	2.176	3.938	3.148
50.0	0.050	0.146	2.391	4.167	3.377
52.5	0.053	0.161	2.616	4.407	3.617
55.0	0.055	0.176	2.850	4.656	3.866
57.5	0.058	0.192	3.094	4.916	4.126
60.0	0.060	0.209	3.347	5.186	4.396

Q-h charakteristika potrubí a čerpadel "ČM1-R2" (0 - 60) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

**R2 - Velké průtoky (0-100) l/s**

**Čerpadlo - ČM1+ČM2**

ČM1	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
T kus (M1+M2) směr od M1					0.430
Σ	0.000	0.000	0.340	0.963	1.688
ČM2	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus (M1+M2) směr od M2					0.460
Σ	0.000	0.000	0.340	0.963	0.678

ČM1+ČM2	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
T kus změna směru 90°					1.040
Nožové šoupátko					0.040
Σ	0.000	0.000	0.000	0.360	2.338

DÉLKY ČM1			DÉLKY ČM2			DÉLKY ČM1+ČM2		
L <sub>DN200</sub>	0.244	m	L <sub>DN200</sub>		m	L <sub>DN200</sub>	0.948	m
L <sub>DN150</sub>	0.699	m	L <sub>DN150</sub>	0.699	m	L <sub>DN150</sub>	1.202	m

#### Potrubí DN200

ČM1									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.001
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.002
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.005
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.009
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.014
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.020
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.027
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.001	0.035
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.001	0.044
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.001	0.066
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.001	0.078
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.002	0.092
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.002	0.107
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.002	0.123
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.002	0.139
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.003	0.157
45.0	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.003	0.176
47.5	0.048	1.512	290583	0.040	0.022	0.022	0.022	0.003	0.197
50.0	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.004	0.218

ČM2									
Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.000
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.001
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.002
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.004
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.005
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.008
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.011
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.000	0.014
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.000	0.018
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.000	0.022
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.000	0.026
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.000	0.032
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.000	0.037
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.000	0.043
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.000	0.049
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.000	0.056
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.000	0.063
45.0	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.000	0.071
47.5	0.048	1.512	290583	0.040	0.022	0.022	0.022	0.000	0.079
50.0	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.000	0.088
ČM1+ČM2									
Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.003
10	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.012
15	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.001	0.027
20	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.002	0.048
25	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.004	0.075
30	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.005	0.109
35	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.007	0.148
40	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.009	0.193
45	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.011	0.244
50	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.014	0.302
55	0.055	1.751	336464	0.040	0.022	0.022	0.022	0.017	0.365
60	0.060	1.910	367052	0.040	0.022	0.022	0.022	0.020	0.435
65	0.065	2.069	397639	0.040	0.022	0.022	0.022	0.023	0.510
70	0.070	2.228	428227	0.040	0.022	0.022	0.022	0.027	0.592
75	0.075	2.387	458815	0.040	0.022	0.022	0.022	0.031	0.679

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
80	0.080	2.546	489402	0.040	0.022	0.022	0.022	0.035	0.773
85	0.085	2.706	519990	0.040	0.022	0.022	0.022	0.039	0.872
90	0.090	2.865	550578	0.040	0.022	0.022	0.022	0.044	0.978
95	0.095	3.024	581165	0.040	0.022	0.022	0.022	0.049	1.090
100	0.100	3.183	611753	0.040	0.022	0.022	0.022	0.054	1.207

#### Potrubí DN150

##### ČM1

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
45.0	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.037	0.907
47.5	0.048	2.688	387443	0.040	0.024	0.024	0.024	0.041	0.991
50.0	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.045	1.078

##### ČM2

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157



Q	Q	$v_{150}$	$Re_{150}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
45.0	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.037	0.907
47.5	0.048	2.688	387443	0.040	0.024	0.024	0.024	0.041	0.991
50.0	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.045	1.078
<b>ČM1+ČM2</b>									
Q	Q	$v_{150}$	$Re_{150}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.001	0.001
10	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.002	0.006
15	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.007	0.013
20	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.013	0.024
25	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.020	0.037
30	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.028	0.053
35	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.039	0.072
40	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.050	0.094
45	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.063	0.119
50	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.078	0.147
55	0.055	3.112	448619	0.040	0.024	0.024	0.024	0.094	0.178
60	0.060	3.395	489402	0.040	0.024	0.024	0.024	0.112	0.212
65	0.065	3.678	530186	0.040	0.024	0.024	0.024	0.131	0.248
70	0.070	3.961	570969	0.040	0.024	0.024	0.024	0.152	0.288
75	0.075	4.244	611753	0.040	0.024	0.024	0.024	0.175	0.331
80	0.080	4.527	652536	0.040	0.024	0.024	0.024	0.198	0.376
85	0.085	4.810	693320	0.040	0.024	0.024	0.024	0.224	0.425
90	0.090	5.093	734103	0.040	0.024	0.024	0.024	0.251	0.476
95	0.095	5.376	774887	0.040	0.024	0.024	0.024	0.279	0.530
100	0.100	5.659	815670	0.040	0.024	0.024	0.024	0.309	0.588

**Potrubí DN100**

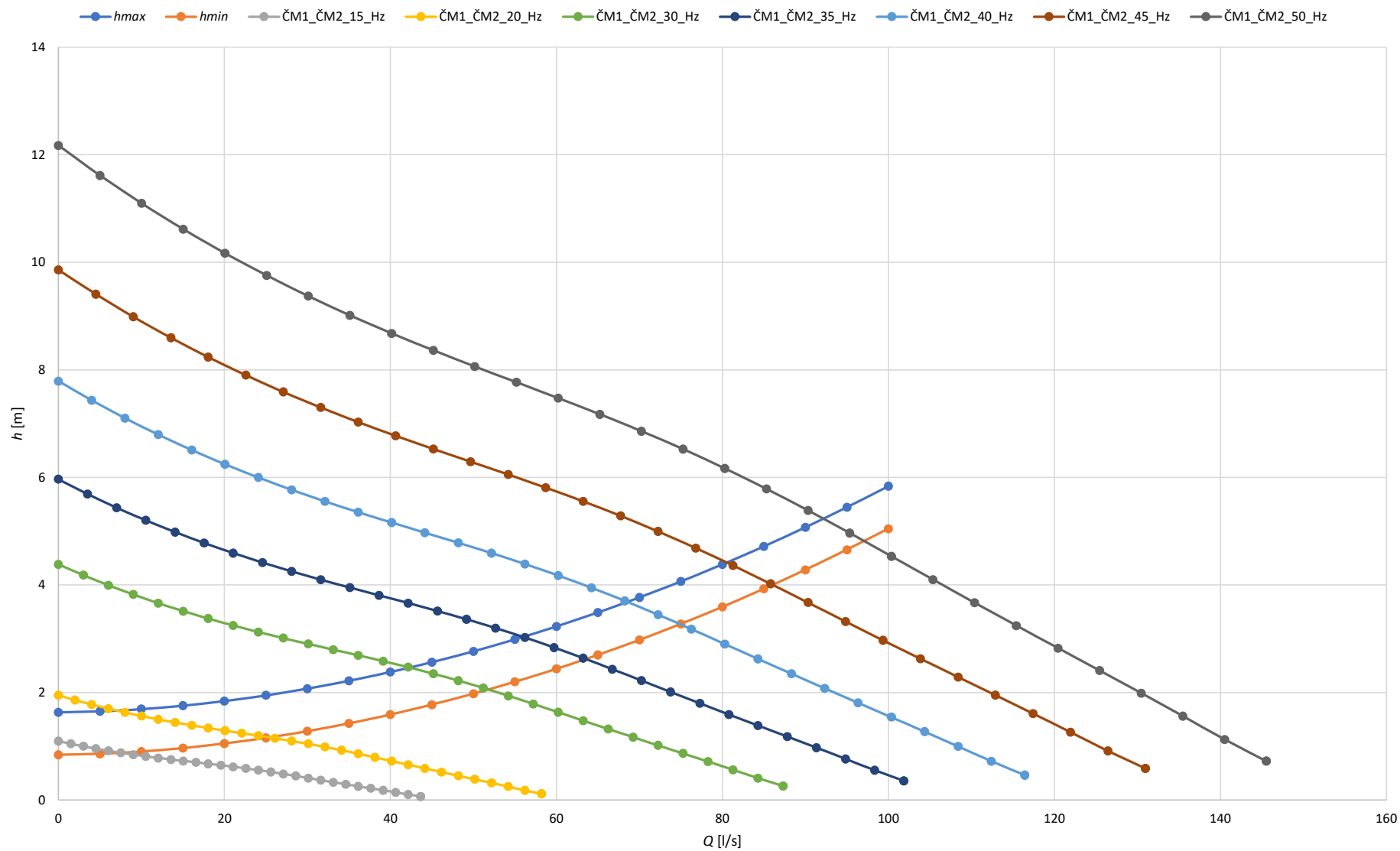
ČM1				ČM2			
Q	Q	v <sub>40</sub>	h <sub>m100</sub>	Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m³/s]	[m/s]	[m]	[l/s]	[m³/s]	[m/s]	[m]
0	0	0	0	0	0	0	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569	45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634	47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702	50.0	0.050	6.366	0.702

**Výsledná tabulka**

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m³/s]	[m]	[m]	[m]	[m]
0	0	0.000	0	1.630	0.840
5	0.005	0.001	0.017	1.648	0.858
10	0.010	0.003	0.056	1.690	0.900
15	0.015	0.009	0.115	1.754	0.964
20	0.020	0.017	0.192	1.839	1.049
25	0.025	0.027	0.288	1.945	1.155
30	0.030	0.038	0.402	2.070	1.280
35	0.035	0.052	0.533	2.214	1.424
40	0.040	0.067	0.681	2.378	1.588
45	0.045	0.085	0.847	2.562	1.772
50	0.050	0.104	1.030	2.765	1.975
55	0.055	0.126	1.231	2.987	2.197
60	0.060	0.150	1.448	3.228	2.438
65	0.065	0.175	1.682	3.488	2.698
70	0.070	0.203	1.934	3.767	2.977
75	0.075	0.233	2.202	4.064	3.274

Q [l/s]	Q [m <sup>3</sup> /s]	$\Sigma h_t$ [m]	$\Sigma h_m$ [m]	$h_{\max}$ [m]	$h_{\min}$ [m]
80	0.080	0.265	2.486	4.381	3.591
85	0.085	0.298	2.788	4.717	3.927
90	0.090	0.334	3.106	5.071	4.281
95	0.095	0.372	3.441	5.444	4.654
100	0.100	0.412	3.793	5.835	5.045

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-R2" - (0 - 100) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3	X		
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

L <sub>DN200</sub>	11.194	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.474	m
L <sub>DN40</sub>	0.634	m

Rozsah průtoků v připojovacím bodě:

R3 - Malé průtoky (0-14) l/s

Čerpadlo - ČM1

	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
Koleno 90°					0.34
T kus změna směru 90°					1.04
Nožové šoupátko					0.040
Σ	0.400	2.414	0.340	1.263	2.678

**Potrubí  
DN200**

Q	Q	$v_{200}$	$Re_{200}$	$Re_{200}$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.0425	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.0358	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.0323	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.0301	0.000	0.001
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.001	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.0272	0.001	0.001
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.0262	0.001	0.002
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.0253	0.001	0.002
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.0246	0.001	0.003
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.002	0.003
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.0234	0.002	0.004
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.0229	0.002	0.005
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.0224	0.003	0.006
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.0220	0.003	0.007
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.004	0.008
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.0213	0.004	0.009
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.0210	0.004	0.010
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.0207	0.005	0.011
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.0204	0.005	0.012
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.006	0.014
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.0196	0.007	0.017
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.0192	0.008	0.020
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.0188	0.009	0.023
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.0185	0.010	0.027

**Potrubí  
DN150**

Q	Q	$v_{150}$	$Re_{150}$	$Re_{150}$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.0396	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.0333	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.0301	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.0280	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.0253	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.0243	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.0235	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.0229	0.001	0.026

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	Re <sub>150</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.030
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.0217	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.0213	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.0209	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.0205	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.0198	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.0195	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.0192	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.0190	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.0183	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.0179	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.0250	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.0249	0.009	0.151

#### Potrubí DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	Re <sub>50</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.0310	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.0261	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.0235	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.0219	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.0207	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.0198	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.0191	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.0184	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.0179	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.0318	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.0317	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.0317	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.0316	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.0316	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.0315	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.0315	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.0315	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.0314	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.0314	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.0314	0.217	1.985
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.0313	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.0313	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.0313	0.366	3.355

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	Re <sub>50</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.0313	0.424	3.890

#### Potrubí DN40

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	Re <sub>40</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.715	2.102

#### Potrubí

#### DN100

Q	Q	v <sub>40</sub>	v <sub>40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003



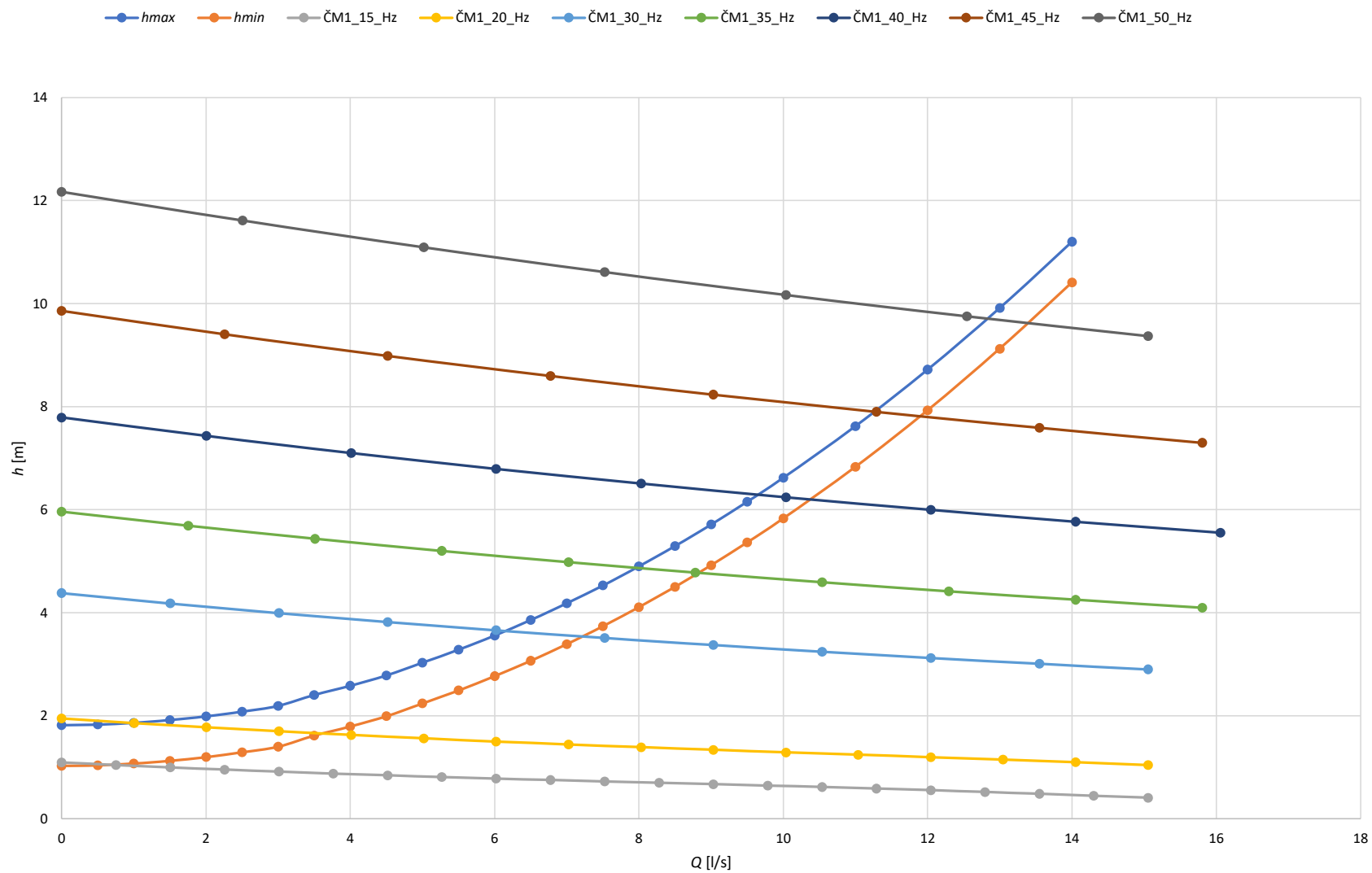
Q	Q	V <sub>40</sub>	V <sub>40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

#### Výsledná tabulka

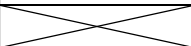
Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	1.818	1.028
0.5	0.001	0.004	0.009	1.830	1.040
1.0	0.001	0.012	0.034	1.863	1.073
1.5	0.002	0.024	0.075	1.917	1.127
2.0	0.002	0.040	0.132	1.989	1.199
2.5	0.003	0.059	0.204	2.081	1.291
3.0	0.003	0.081	0.293	2.191	1.401
3.5	0.004	0.190	0.397	2.405	1.615
4.0	0.004	0.247	0.517	2.582	1.792
4.5	0.005	0.311	0.653	2.782	1.992
5.0	0.005	0.407	0.805	3.030	2.240
5.5	0.006	0.492	0.973	3.283	2.493
6.0	0.006	0.585	1.156	3.559	2.769
6.5	0.007	0.686	1.355	3.858	3.068
7.0	0.007	0.794	1.570	4.182	3.392
7.5	0.008	0.911	1.800	4.529	3.739
8.0	0.008	1.036	2.046	4.900	4.110
8.5	0.009	1.168	2.308	5.294	4.504
9.0	0.009	1.309	2.586	5.713	4.923

Q [l/s]	Q [m <sup>3</sup> /s]	$\Sigma h_t$ [m]	$\Sigma h_m$ [m]	$h_{\max}$ [m]	$h_{\min}$ [m]
9.5	0.010	1.458	2.879	6.155	5.365
10.0	0.010	1.615	3.188	6.620	5.830
11.0	0.011	1.952	3.853	7.623	6.833
12.0	0.012	2.321	4.581	8.720	7.930
13.0	0.013	2.725	5.372	9.914	9.124
14.0	0.014	3.158	6.225	11.201	10.411

Q-h charakteristika potrubí a čerpadel "ČM1-R3"- (0 - 14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

L <sub>DN200</sub>	11.910	m
L <sub>DN150</sub>	1.901	m

Rozsah průtoků v připojovacím bodě:

**R3 - Velké průtoky (0-60) l/s**

**Čerpadlo - ČM1**

	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
Koleno 90°					0.340
T kus změna směru 90°					1.040
Nožové šoupátko					0.040
Σ	0.000	0.000	0.340	1.323	2.896

**Potrubí DN200**

Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.001	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.002	0.004
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.004	0.008
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.006	0.015
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.009	0.023
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.013	0.034
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.022	0.046
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.029	0.060
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.036	0.076
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.044	0.093
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.053	0.113
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.063	0.135
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.074	0.158
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.086	0.183
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.098	0.210
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.111	0.239
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.125	0.270
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.140	0.303
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.156	0.337
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.173	0.374
52.5	0.053	1.671	321170	0.0400	0.0222	0.0224	0.0224	0.190	0.412
55.0	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.208	0.452
57.5	0.058	1.830	351758	0.0400	0.0222	0.0224	0.0224	0.227	0.494
60.0	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.247	0.538

**Potrubí DN150**

Q	Q	$v_{150}$	$Re_{150}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270

Q	Q	$v_{150}$	$Re_{150}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225
52.5	0.053	2.971	428227	0.0400	0.0238	0.0238	0.0238	0.136	1.330
55.0	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.149	1.439
57.5	0.058	3.254	469011	0.0400	0.0237	0.0238	0.0238	0.163	1.551
60.0	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.177	1.667

#### Potrubí DN100

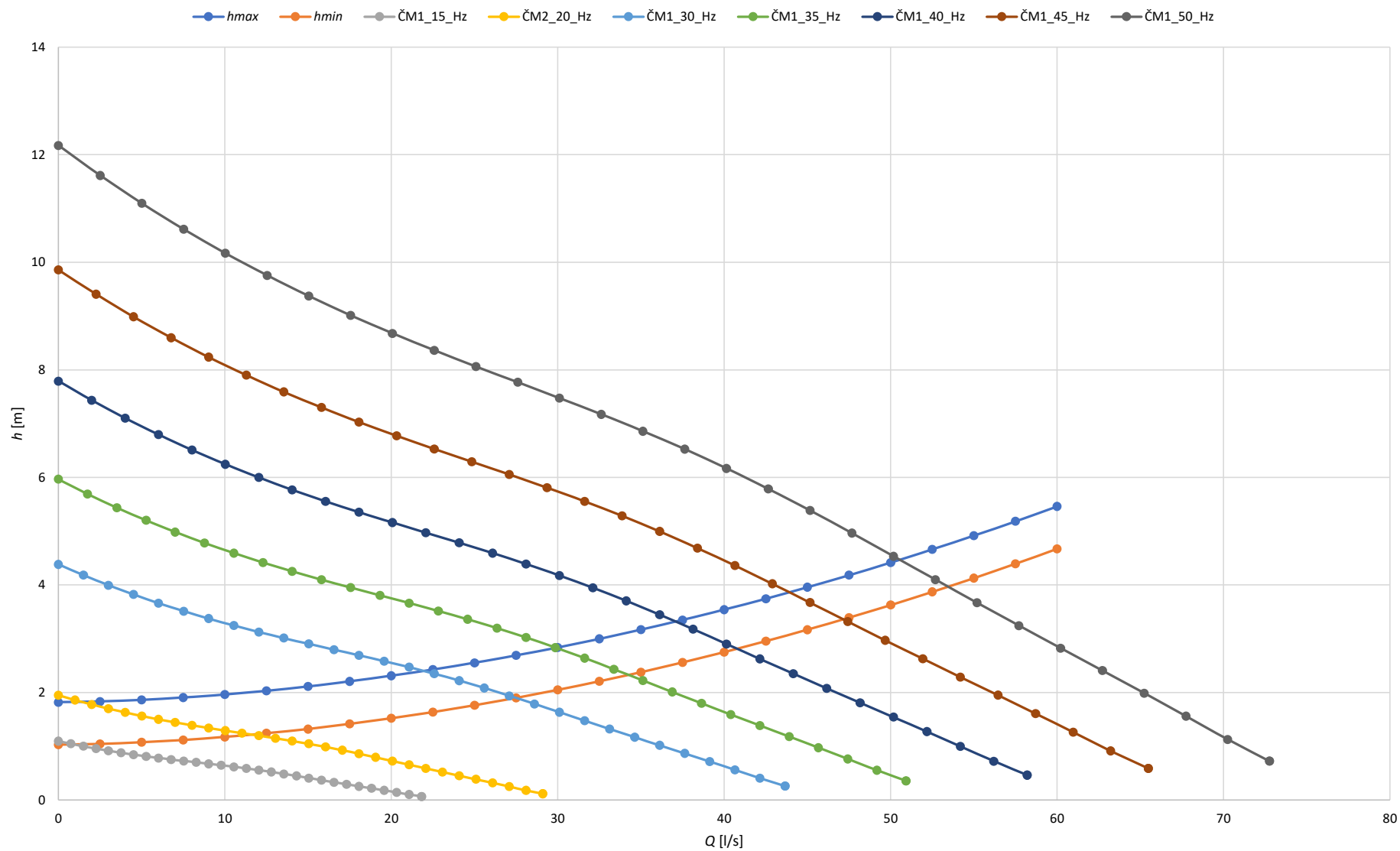
Q	Q	$v_{40}$	$h_{m40}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702
52.5	0.053	6.685	0.774
55.0	0.055	7.003	0.850

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
57.5	0.058	7.321	0.929
60.0	0.060	7.639	1.011

#### Výsledná tabulka

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	1.818	1.028
2.5	0.003	0.001	0.013	1.832	1.042
5.0	0.005	0.003	0.041	1.862	1.072
7.5	0.008	0.006	0.081	1.906	1.116
10.0	0.010	0.010	0.133	1.961	1.171
12.5	0.013	0.017	0.195	2.030	1.240
15.0	0.015	0.024	0.267	2.109	1.319
17.5	0.018	0.038	0.350	2.206	1.416
20.0	0.020	0.049	0.443	2.310	1.520
22.5	0.023	0.062	0.545	2.425	1.635
25.0	0.025	0.076	0.657	2.551	1.761
27.5	0.028	0.091	0.779	2.689	1.899
30.0	0.030	0.108	0.911	2.837	2.047
32.5	0.033	0.127	1.052	2.997	2.207
35.0	0.035	0.147	1.203	3.167	2.377
37.5	0.038	0.168	1.362	3.348	2.558
40.0	0.040	0.191	1.532	3.540	2.750
42.5	0.043	0.215	1.710	3.743	2.953
45.0	0.045	0.240	1.898	3.956	3.166
47.5	0.048	0.268	2.095	4.180	3.390
50.0	0.050	0.296	2.301	4.415	3.625
52.5	0.053	0.326	2.516	4.660	3.870
55.0	0.055	0.357	2.741	4.916	4.126
57.5	0.058	0.390	2.974	5.182	4.392
60.0	0.060	0.424	3.217	5.459	4.669

Q-h charakteristika potrubí a čerpadel "ČM1-R3" - (0 - 60) l/s





## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Přípojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			X
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

**Rozsah průtoků v přípojovacím bodě:**

**R3 - Velké průtoky (0-100) l/s**

**Čerpadlo - ČM1+ČM2**

ČM1			
Singularity	DN100	DN150	DN200
Koleno 90°	0.340		
Rozšíření z DN 100 na DN 150		0.563	
Koleno 90°		0.340	
Nožové šoupátko		0.060	
Rozšíření z DN 150 na DN 200			0.218
T kus změna směru 90°			1.040
T kus (M1+M2) směr od M1			0.430
Σ	0.340	0.963	1.688
ČM2			
Singularity	DN100	DN150	DN200
Koleno 90°	0.340		
Rozšíření z DN 100 na DN 150		0.563	
Koleno 90°		0.340	
Nožové šoupátko		0.060	
Rozšíření z DN 150 na DN 200			0.218
T kus (M1+M2) směr od M2			0.460
Σ	0.340	0.963	0.678

ČM1+ČM2			
Singularity	DN100	DN150	DN200
Zúžení z DN 200 na DN 150		0.200	
Indukční průtokoměr DN 150		0.100	
Nožové šoupátko		0.06	
Rozšíření z DN 150 na DN 200			0.218
Koleno 90°			0.340
T kus změna směru 90°			1.040
Nožové šoupátko			0.040
Σ	0	0.360	1.638

DÉLKY ČM1		DÉLKY ČM2		DÉLKY ČM1+ČM2	
L <sub>DN200</sub>	0.244 m	L <sub>DN200</sub>	m	L <sub>DN200</sub>	11.31 m
L <sub>DN150</sub>	0.699 m	L <sub>DN150</sub>	0.699 m	L <sub>DN150</sub>	1.202 m

#### Potrubí DN200

ČM1									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.001
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.002
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.005
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.009
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.014
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.020
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.027
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.001	0.035
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.001	0.044
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.001	0.054
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.001	0.066
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.001	0.078
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.002	0.092
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.002	0.107
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.002	0.123
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.002	0.139
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.003	0.157
45.0	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.003	0.176
47.5	0.048	1.512	290583	0.040	0.022	0.022	0.022	0.003	0.197
50.0	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.004	0.218

ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.000
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.001
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.002
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.004
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.005
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.008
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.011
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.000	0.014
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.000	0.018
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.000	0.022
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.000	0.026
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.000	0.032
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.000	0.037
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.000	0.043
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.000	0.049
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.000	0.056
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.000	0.063
45.0	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.000	0.071
47.5	0.048	1.512	290583	0.040	0.022	0.022	0.022	0.000	0.079
50.0	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.000	0.088
ČM1+ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.002	0.002
10	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.006	0.008
15	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.012	0.019
20	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.027	0.034
25	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.042	0.053
30	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.060	0.076
35	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.081	0.104
40	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.106	0.135
45	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.133	0.171
50	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.164	0.211
55	0.055	1.751	336464	0.040	0.022	0.022	0.022	0.198	0.256
60	0.060	1.910	367052	0.040	0.022	0.022	0.022	0.235	0.304
65	0.065	2.069	397639	0.040	0.022	0.022	0.022	0.275	0.357
70	0.070	2.228	428227	0.040	0.022	0.022	0.022	0.318	0.414
75	0.075	2.387	458815	0.040	0.022	0.022	0.022	0.365	0.476

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
80	0.080	2.546	489402	0.040	0.022	0.022	0.022	0.415	0.541
85	0.085	2.706	519990	0.040	0.022	0.022	0.022	0.468	0.611
90	0.090	2.865	550578	0.040	0.022	0.022	0.022	0.524	0.685
95	0.095	3.024	581165	0.040	0.022	0.022	0.022	0.583	0.763
100	0.100	3.183	611753	0.040	0.022	0.022	0.022	0.645	0.846

#### Potrubí DN150

##### ČM1

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
45.0	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.037	0.907
47.5	0.048	2.688	387443	0.040	0.024	0.024	0.024	0.041	0.991
50.0	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.045	1.078

##### ČM2

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
45.0	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.037	0.907
47.5	0.048	2.688	387443	0.040	0.024	0.024	0.024	0.041	0.991
50.0	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.045	1.078
<b>ČM1+ČM2</b>									
Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.001	0.001
10	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.002	0.006
15	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.007	0.013
20	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.013	0.024
25	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.020	0.037
30	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.028	0.053
35	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.039	0.072
40	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.050	0.094
45	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.063	0.119
50	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.078	0.147
55	0.055	3.112	448619	0.040	0.024	0.024	0.024	0.094	0.178
60	0.060	3.395	489402	0.040	0.024	0.024	0.024	0.112	0.212
65	0.065	3.678	530186	0.040	0.024	0.024	0.024	0.131	0.248
70	0.070	3.961	570969	0.040	0.024	0.024	0.024	0.152	0.288
75	0.075	4.244	611753	0.040	0.024	0.024	0.024	0.175	0.331
80	0.080	4.527	652536	0.040	0.024	0.024	0.024	0.198	0.376
85	0.085	4.810	693320	0.040	0.024	0.024	0.024	0.224	0.425
90	0.090	5.093	734103	0.040	0.024	0.024	0.024	0.251	0.476
95	0.095	5.376	774887	0.040	0.024	0.024	0.024	0.279	0.530
100	0.100	5.659	815670	0.040	0.024	0.024	0.024	0.309	0.588

**Potrubí DN100**

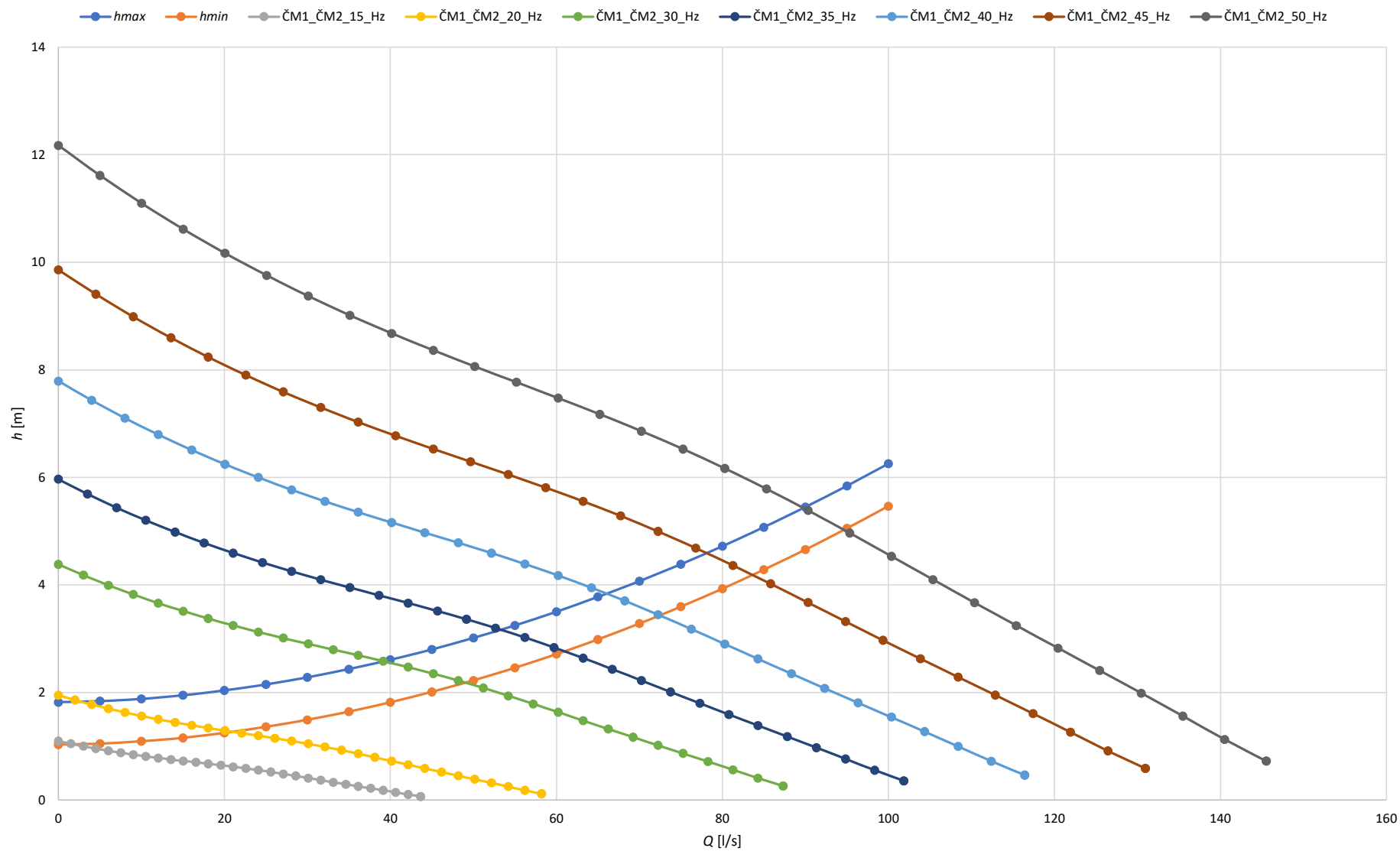
ČM1				ČM2			
Q	Q	v <sub>40</sub>	h <sub>m100</sub>	Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m³/s]	[m/s]	[m]	[l/s]	[m³/s]	[m/s]	[m]
0	0	0	0	0	0	0	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.0018
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.0158
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.0281
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.0439
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.0632
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.1124
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.1422
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.1756
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.2125
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.2528
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.2967
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.3441
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.3951
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.4495
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.5074
45.0	0.045	5.730	0.569	45.0	0.045	5.730	0.5689
47.5	0.048	6.048	0.634	47.5	0.048	6.048	0.6339
50.0	0.050	6.366	0.702	50.0	0.050	6.366	0.7023

**Výsledná tabulka**

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m³/s]	[m]	[m]	[m]	[m]
0	0	0	0	1.818	1.028
5	0.005	0.003	0.016	1.837	1.047
10	0.010	0.009	0.053	1.879	1.089
15	0.015	0.020	0.107	1.945	1.155
20	0.020	0.042	0.178	2.038	1.248
25	0.025	0.065	0.265	2.149	1.359
30	0.030	0.093	0.369	2.280	1.490
35	0.035	0.126	0.488	2.432	1.642
40	0.040	0.164	0.623	2.605	1.815
45	0.045	0.207	0.774	2.799	2.009
50	0.050	0.254	0.940	3.012	2.222
55	0.055	0.307	1.121	3.246	2.456
60	0.060	0.365	1.318	3.501	2.711
65	0.065	0.427	1.530	3.775	2.985
70	0.070	0.495	1.756	4.069	3.279
75	0.075	0.567	1.998	4.383	3.593

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
80	0.080	0.645	2.255	4.718	3.928
85	0.085	0.727	2.527	5.072	4.282
90	0.090	0.814	2.814	5.446	4.656
95	0.095	0.906	3.115	5.840	5.050
100	0.100	1.004	3.431	6.253	5.463

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-R3" - (0 - 100) l/s





## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4	X		
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

$L_{DN200}$	10.886	m
$L_{DN150}$	1.676	m
$L_{DN50}$	0.474	m
$L_{DN40}$	0.634	m

Rozsah průtoků v připojovacím bodě:

**R4 - Malé průtoky (0-14)**

l/s

Čerpadlo - ČM1

$\zeta$					
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
Koleno 90°					0.34
Koleno 90°					0.34
Nožové šoupátko					0.040
$\Sigma$	0.400	2.414	0.340	1.263	1.978

**Potrubí  
DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.0425	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.0358	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.0323	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.0301	0.000	0.000
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.0272	0.001	0.001
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.0262	0.001	0.001
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.0253	0.001	0.002
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.0246	0.001	0.002
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.002	0.003
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.0234	0.002	0.003
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.0229	0.002	0.004
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.0224	0.003	0.004
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.0220	0.003	0.005
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.003	0.006
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.0213	0.004	0.007
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.0210	0.004	0.007
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.0207	0.005	0.008
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.0204	0.005	0.009
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.006	0.010
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.0196	0.007	0.012
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.0192	0.008	0.015
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.0188	0.009	0.017
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.0185	0.010	0.020

**Potrubí  
DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.0396	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.0333	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.0301	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.0280	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.0253	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.0243	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.0235	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.0229	0.001	0.026
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.030

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.0217	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.0213	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.0209	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.0205	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.0198	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.0195	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.0192	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.0190	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.0183	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.0179	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.0250	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.0249	0.009	0.151

#### Potrubí DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.0310	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.0261	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.0235	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.0219	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.0207	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.0198	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.0191	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.0184	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.0179	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.0318	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.0317	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.0317	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.0316	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.0316	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.0315	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.0315	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.0315	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.0314	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.0314	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.0314	0.217	1.985
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.0313	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.0313	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.0313	0.366	3.355
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.0313	0.424	3.890

**Potrubí DN40**

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.715	2.102

**Potrubí  
DN100**

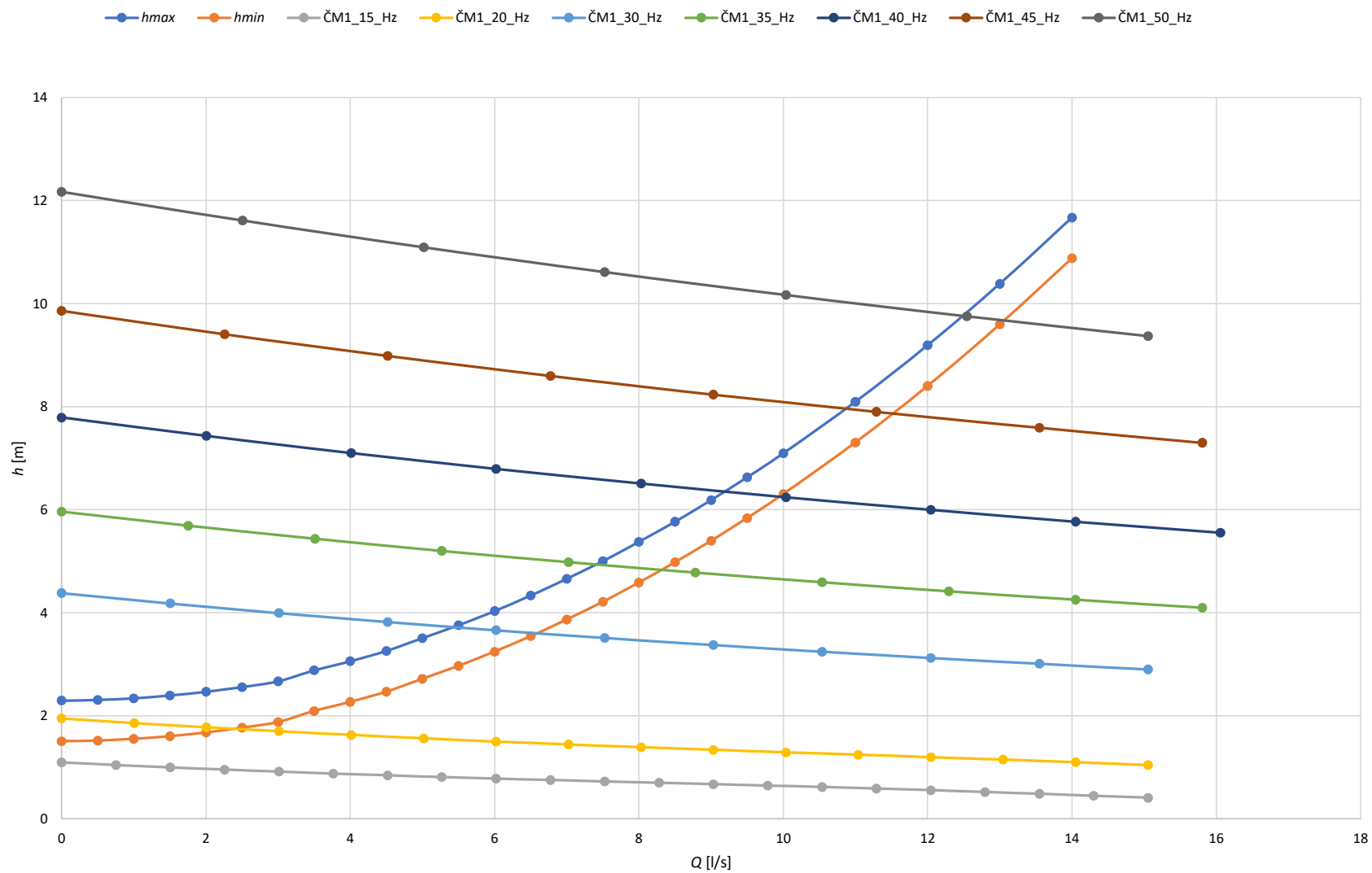
Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008

Q	Q	V <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

#### Výsledná tabulka

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	2.296	1.506
0.5	0.001	0.004	0.009	2.308	1.518
1.0	0.001	0.012	0.034	2.341	1.551
1.5	0.002	0.024	0.075	2.394	1.604
2.0	0.002	0.040	0.131	2.467	1.677
2.5	0.003	0.059	0.204	2.558	1.768
3.0	0.003	0.081	0.293	2.669	1.879
3.5	0.004	0.190	0.397	2.882	2.092
4.0	0.004	0.247	0.517	3.059	2.269
4.5	0.005	0.311	0.653	3.259	2.469
5.0	0.005	0.407	0.804	3.507	2.717
5.5	0.006	0.492	0.972	3.759	2.969
6.0	0.006	0.585	1.155	4.035	3.245
6.5	0.007	0.686	1.353	4.334	3.544
7.0	0.007	0.794	1.568	4.658	3.868
7.5	0.008	0.911	1.798	5.004	4.214
8.0	0.008	1.036	2.044	5.375	4.585
8.5	0.009	1.168	2.305	5.769	4.979
9.0	0.009	1.309	2.583	6.187	5.397
9.5	0.010	1.458	2.876	6.629	5.839
10.0	0.010	1.614	3.184	7.094	6.304
11.0	0.011	1.952	3.849	8.096	7.306
12.0	0.012	2.321	4.576	9.192	8.402
13.0	0.013	2.724	5.366	10.386	9.596
14.0	0.014	3.158	6.218	11.672	10.882

Q-h charakteristika potrubí a čerpadel "ČM1-R4" - (0 - 14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4		X	
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

$L_{DN200}$	11.602	m
$L_{DN150}$	1.901	m

Rozsah průtoků v připojovacím bodě:

**R4 - Velké průtoky (0-60) l/s**

**Čerpadlo - ČM1**

	$\zeta$				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
Koleno 90°					0.340
Koleno 90°					0.340
Nožové šoupátko					0.040
$\Sigma$	0	0	0.340	1.323	2.196

### Potrubi DN200

Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.001	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.002	0.003

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.004	0.006
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.006	0.011
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.009	0.018
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.012	0.026
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.022	0.035
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.028	0.045
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.035	0.057
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.043	0.071
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.052	0.086
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.062	0.102
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.072	0.120
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.083	0.139
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.096	0.159
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.108	0.181
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.122	0.205
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.137	0.230
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.152	0.256
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.168	0.283
52.5	0.053	1.671	321170	0.0400	0.0222	0.0224	0.0224	0.185	0.313
55.0	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.203	0.343
57.5	0.058	1.830	351758	0.0400	0.0222	0.0224	0.0224	0.221	0.375
60.0	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.241	0.408

#### Potrubí DN150

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843



Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225
52.5	0.053	2.971	428227	0.0400	0.0238	0.0238	0.0238	0.136	1.330
55.0	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.149	1.439
57.5	0.058	3.254	469011	0.0400	0.0237	0.0238	0.0238	0.163	1.551
60.0	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.177	1.667

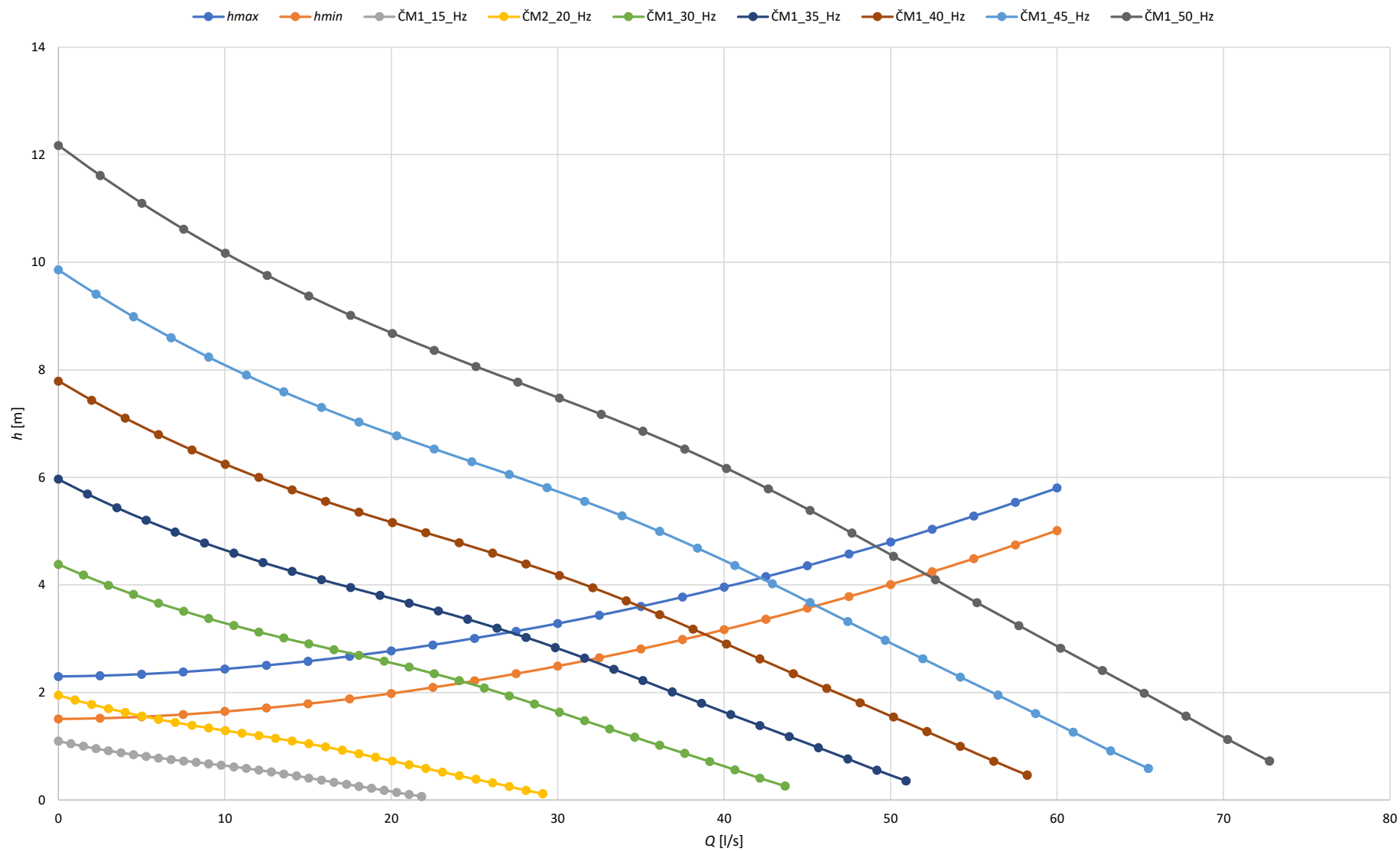
#### Potrubi DN100

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702
52.5	0.053	6.685	0.774
55.0	0.055	7.003	0.850
57.5	0.058	7.321	0.929
60.0	0.060	7.639	1.011

**Výsledná tabulka**

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	2.296	1.506
2.5	0.003	0.001	0.013	2.310	1.520
5.0	0.005	0.003	0.040	2.339	1.549
7.5	0.008	0.006	0.079	2.381	1.591
10.0	0.010	0.010	0.129	2.435	1.645
12.5	0.013	0.017	0.189	2.502	1.712
15.0	0.015	0.024	0.259	2.578	1.788
17.5	0.018	0.037	0.339	2.672	1.882
20.0	0.020	0.048	0.428	2.772	1.982
22.5	0.023	0.061	0.527	2.883	2.093
25.0	0.025	0.075	0.635	3.005	2.215
27.5	0.028	0.090	0.752	3.138	2.348
30.0	0.030	0.107	0.878	3.281	2.491
32.5	0.033	0.125	1.014	3.434	2.644
35.0	0.035	0.144	1.158	3.598	2.808
37.5	0.038	0.165	1.312	3.772	2.982
40.0	0.040	0.188	1.474	3.957	3.167
42.5	0.043	0.212	1.645	4.152	3.362
45.0	0.045	0.237	1.825	4.357	3.567
47.5	0.048	0.263	2.013	4.572	3.782
50.0	0.050	0.292	2.211	4.798	4.008
52.5	0.053	0.321	2.417	5.033	4.243
55.0	0.055	0.352	2.631	5.279	4.489
57.5	0.058	0.384	2.855	5.535	4.745
60.0	0.060	0.418	3.087	5.800	5.010

Q-h charakteristika potrubí a čerpadel "ČM1-R4" - (0 - 60) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Přípojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			X
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

**Rozsah průtoků v přípojovacím bodě:**

**R4 - Velké průtoky (0-100) l/s**

**Čerpadlo - ČM1+ČM2**

ČM1	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
T kus (M1+M2) směr od M1					0.430
Σ	0	0	0.340	0.963	1.688
ČM2	ζ				
DN5					
Singularity	DN40	0	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus (M1+M2) směr od M2					0.460
Σ	0	0	0.340	0.963	0.678

ČM1+ČM2	$\zeta$							
Singularity	DN40	DN50	DN100	DN150	DN200			
Zúžení z DN 200 na DN 150				0.200				
Indukční průtokoměr DN 150				0.100				
Nožové šoupátko				0.06				
Rozšíření z DN 150 na DN 200					0.218			
Koleno 90°					0.340			
Koleno 90°					0.340			
Nožové šoupátko					0.040			
$\Sigma$	0	0	0	0.360	0.938			
DÉLKY ČM1				DÉLKY ČM2			DÉLKY ČM1+ČM2	
$L_{DN200}$	0.244	m	$L_{DN200}$		m	$L_{DN200}$	11.002	m
$L_{DN150}$	0.699	m	$L_{DN150}$	0.699	m	$L_{DN150}$	1.202	m

### Potrubí DN200

ČM1									
Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.001
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.002
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.005
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.009
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.014
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.020
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.027
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.001	0.035
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.001	0.044
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.001	0.054
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.001	0.066
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.001	0.078
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.002	0.092
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.002	0.107
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.002	0.123
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.002	0.139
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.003	0.157
45.0	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.003	0.176
47.5	0.048	1.512	290583	0.040	0.022	0.022	0.022	0.003	0.197
50.0	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.004	0.218

ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.040	0.028	0.028	0.028	0.000	0.000
5.0	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.000	0.001
7.5	0.008	0.239	45881	0.040	0.022	0.022	0.022	0.000	0.002
10.0	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.000	0.004
12.5	0.013	0.398	76469	0.040	0.019	0.019	0.019	0.000	0.005
15.0	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.000	0.008
17.5	0.018	0.557	107057	0.040	0.023	0.024	0.024	0.000	0.011
20.0	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.000	0.014
22.5	0.023	0.716	137644	0.040	0.023	0.023	0.023	0.000	0.018
25.0	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.000	0.022
27.5	0.028	0.875	168232	0.040	0.023	0.023	0.023	0.000	0.026
30.0	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.000	0.032
32.5	0.033	1.035	198820	0.040	0.023	0.023	0.023	0.000	0.037
35.0	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.000	0.043
37.5	0.038	1.194	229407	0.040	0.022	0.023	0.023	0.000	0.049
40.0	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.000	0.056
42.5	0.043	1.353	259995	0.040	0.022	0.023	0.023	0.000	0.063
45.0	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.000	0.071
47.5	0.048	1.512	290583	0.040	0.022	0.022	0.022	0.000	0.079
50.0	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.000	0.088
ČM1+ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.040	0.024	0.024	0.024	0.002	0.001
10	0.010	0.318	61175	0.040	0.020	0.020	0.020	0.006	0.005
15	0.015	0.477	91763	0.040	0.018	0.018	0.018	0.012	0.011
20	0.020	0.637	122351	0.040	0.023	0.023	0.023	0.027	0.019
25	0.025	0.796	152938	0.040	0.023	0.023	0.023	0.041	0.030
30	0.030	0.955	183526	0.040	0.023	0.023	0.023	0.059	0.044
35	0.035	1.114	214113	0.040	0.022	0.023	0.023	0.079	0.059
40	0.040	1.273	244701	0.040	0.022	0.023	0.023	0.103	0.077
45	0.045	1.432	275289	0.040	0.022	0.023	0.023	0.130	0.098
50	0.050	1.592	305876	0.040	0.022	0.022	0.022	0.159	0.121
55	0.055	1.751	336464	0.040	0.022	0.022	0.022	0.192	0.146
60	0.060	1.910	367052	0.040	0.022	0.022	0.022	0.228	0.174
65	0.065	2.069	397639	0.040	0.022	0.022	0.022	0.268	0.205
70	0.070	2.228	428227	0.040	0.022	0.022	0.022	0.310	0.237
75	0.075	2.387	458815	0.040	0.022	0.022	0.022	0.355	0.272

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
80	0.080	2.546	489402	0.040	0.022	0.022	0.022	0.403	0.310
85	0.085	2.706	519990	0.040	0.022	0.022	0.022	0.455	0.350
90	0.090	2.865	550578	0.040	0.022	0.022	0.022	0.509	0.392
95	0.095	3.024	581165	0.040	0.022	0.022	0.022	0.567	0.437
100	0.100	3.183	611753	0.040	0.022	0.022	0.022	0.628	0.484

#### Potrubí DN150

##### ČM1

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
45.0	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.037	0.907
47.5	0.048	2.688	387443	0.040	0.024	0.024	0.024	0.041	0.991
50.0	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.045	1.078

##### ČM2

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.040	0.026	0.026	0.026	0.000	0.010
5.0	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.000	0.029
7.5	0.008	0.424	61175	0.040	0.020	0.020	0.020	0.001	0.054
10.0	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.001	0.084
12.5	0.013	0.707	101959	0.040	0.025	0.025	0.025	0.003	0.118
15.0	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.004	0.157
17.5	0.018	0.990	142742	0.040	0.024	0.025	0.025	0.006	0.200

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
20.0	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.007	0.247
22.5	0.023	1.273	183526	0.040	0.024	0.024	0.024	0.009	0.297
25.0	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.012	0.352
27.5	0.028	1.556	224309	0.040	0.024	0.024	0.024	0.014	0.409
30.0	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.017	0.471
32.5	0.033	1.839	265093	0.040	0.024	0.024	0.024	0.019	0.535
35.0	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.022	0.603
37.5	0.038	2.122	305876	0.040	0.024	0.024	0.024	0.026	0.674
40.0	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.029	0.749
42.5	0.043	2.405	346660	0.040	0.024	0.024	0.024	0.033	0.826
45.0	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.037	0.907
47.5	0.048	2.688	387443	0.040	0.024	0.024	0.024	0.041	0.991
50.0	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.045	1.078
<b>ČM1+ČM2</b>									
Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.283	40784	0.040	0.022	0.022	0.022	0.001	0.001
10	0.010	0.566	81567	0.040	0.019	0.019	0.019	0.002	0.006
15	0.015	0.849	122351	0.040	0.025	0.025	0.025	0.007	0.013
20	0.020	1.132	163134	0.040	0.024	0.025	0.024	0.013	0.024
25	0.025	1.415	203918	0.040	0.024	0.024	0.024	0.020	0.037
30	0.030	1.698	244701	0.040	0.024	0.024	0.024	0.028	0.053
35	0.035	1.981	285485	0.040	0.024	0.024	0.024	0.039	0.072
40	0.040	2.264	326268	0.040	0.024	0.024	0.024	0.050	0.094
45	0.045	2.546	367052	0.040	0.024	0.024	0.024	0.063	0.119
50	0.050	2.829	407835	0.040	0.024	0.024	0.024	0.078	0.147
55	0.055	3.112	448619	0.040	0.024	0.024	0.024	0.094	0.178
60	0.060	3.395	489402	0.040	0.024	0.024	0.024	0.112	0.212
65	0.065	3.678	530186	0.040	0.024	0.024	0.024	0.131	0.248
70	0.070	3.961	570969	0.040	0.024	0.024	0.024	0.152	0.288
75	0.075	4.244	611753	0.040	0.024	0.024	0.024	0.175	0.331
80	0.080	4.527	652536	0.040	0.024	0.024	0.024	0.198	0.376
85	0.085	4.810	693320	0.040	0.024	0.024	0.024	0.224	0.425
90	0.090	5.093	734103	0.040	0.024	0.024	0.024	0.251	0.476
95	0.095	5.376	774887	0.040	0.024	0.024	0.024	0.279	0.530
100	0.100	5.659	815670	0.040	0.024	0.024	0.024	0.309	0.588



**Potrubí DN100**

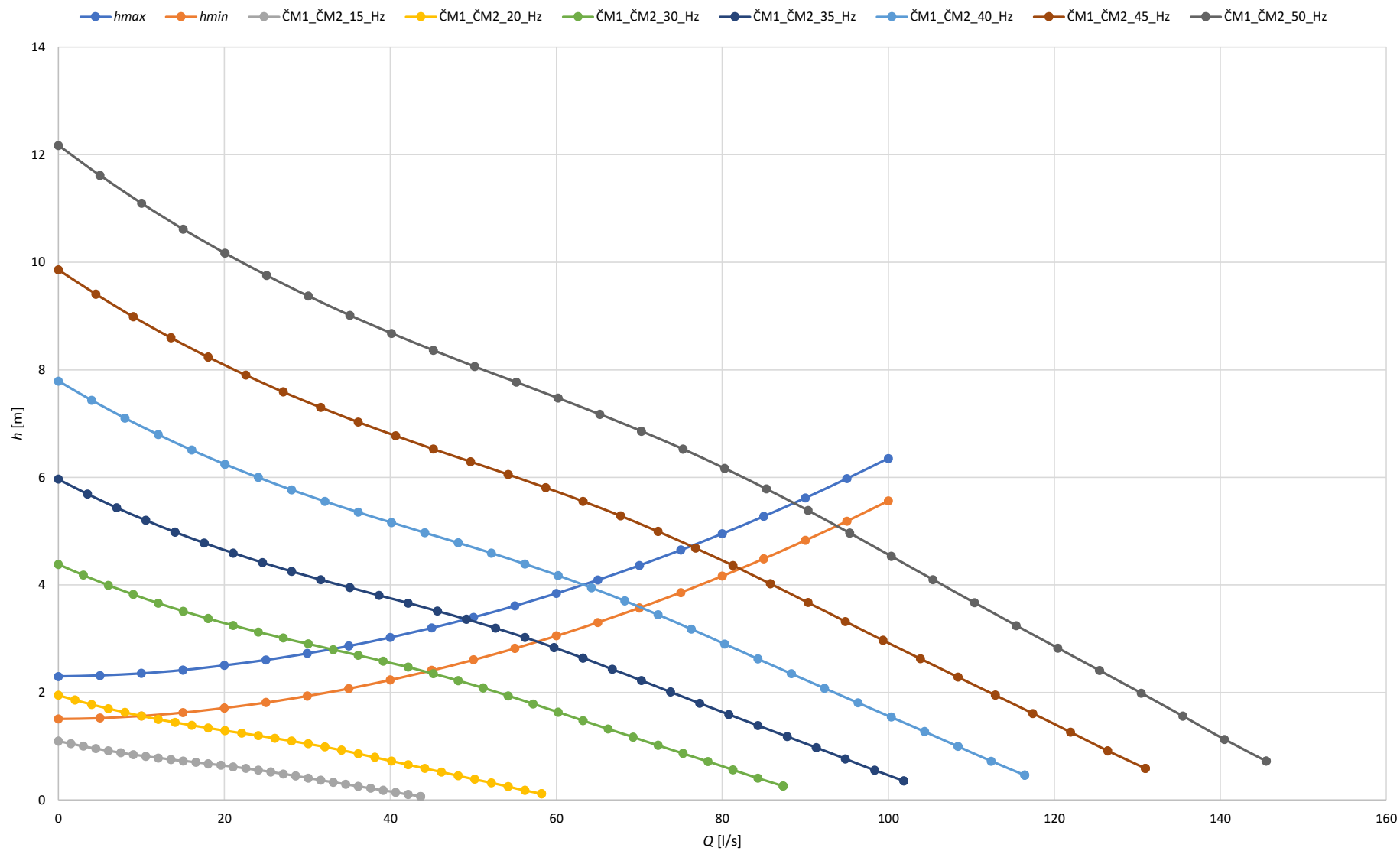
ČM1				ČM2			
Q	Q	V <sub>100</sub>	h <sub>m100</sub>	Q	Q	V <sub>100</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]	[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0	0	0	0	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569	45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634	47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702	50.0	0.050	6.366	0.702

**Výsledná tabulka**

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0.000	0	2.296	1.506
5	0.005	0.003	0.015	2.313	1.523
10	0.010	0.009	0.049	2.353	1.563
15	0.015	0.020	0.099	2.414	1.624
20	0.020	0.041	0.163	2.500	1.710
25	0.025	0.064	0.243	2.602	1.812
30	0.030	0.091	0.336	2.723	1.933
35	0.035	0.124	0.444	2.864	2.074
40	0.040	0.161	0.566	3.022	2.232
45	0.045	0.203	0.701	3.199	2.409
50	0.050	0.250	0.850	3.395	2.605
55	0.055	0.302	1.012	3.609	2.819
60	0.060	0.358	1.188	3.842	3.052
65	0.065	0.420	1.377	4.092	3.302
70	0.070	0.486	1.579	4.361	3.571
75	0.075	0.557	1.795	4.648	3.858

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
80	0.080	0.633	2.024	4.953	4.163
85	0.085	0.714	2.266	5.275	4.485
90	0.090	0.800	2.521	5.616	4.826
95	0.095	0.891	2.789	5.975	5.185
100	0.100	0.986	3.070	6.352	5.562

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-R4" - (0 - 100) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5	X		
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

**Rozsah průtoků v připojovacím bodě:**

**R5 - Malé průtoky (0-14) l/s**

**Čerpadlo - ČM1**

**Délky:**

L <sub>DN200</sub>	9.141	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.474	m
L <sub>DN40</sub>	0.634	m

ζ					
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
T kus změna směru 90°					1.04
Nožové šoupátko					0.04
Pryžový kompenzátor					0.07072
Koleno 90°					0.34
T kus změna směru 90°					1.040
Σ	0.400	2.414	0.340	1.263	3.788

**Potrubí  
DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.043	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.036	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.032	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.030	0.000	0.001
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.028	0.000	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.027	0.001	0.002
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.026	0.001	0.002
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.025	0.001	0.003
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.025	0.001	0.004
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.024	0.001	0.005
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.023	0.002	0.006
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.023	0.002	0.007
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.022	0.002	0.008
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.022	0.003	0.010
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.022	0.003	0.011
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.021	0.003	0.013
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.021	0.004	0.014
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.021	0.004	0.016
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.020	0.004	0.018
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.020	0.005	0.020
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.020	0.006	0.024
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.019	0.007	0.028
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.019	0.008	0.033
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.018	0.009	0.038

**Potrubí  
DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.040	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.033	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.030	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.028	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.026	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.025	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.024	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.024	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.023	0.001	0.026
Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>

[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.022	0.001	0.030
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.022	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.021	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.021	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.020	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.020	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.020	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.019	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.019	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.019	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.019	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.018	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.018	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.025	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.025	0.009	0.151

#### Potrubí DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.031	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.026	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.024	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.022	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.021	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.020	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.019	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.018	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.018	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.032	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.032	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.032	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.032	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.032	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.032	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.031	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.031	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.031	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.031	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.031	0.217	1.985
Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>

[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.031	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.031	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.031	0.366	3.355
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.031	0.424	3.890

#### Potrubí DN40

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.715	2.102

#### Potrubí DN100

Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
Q	Q	v <sub>40</sub>	h <sub>m100</sub>

[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

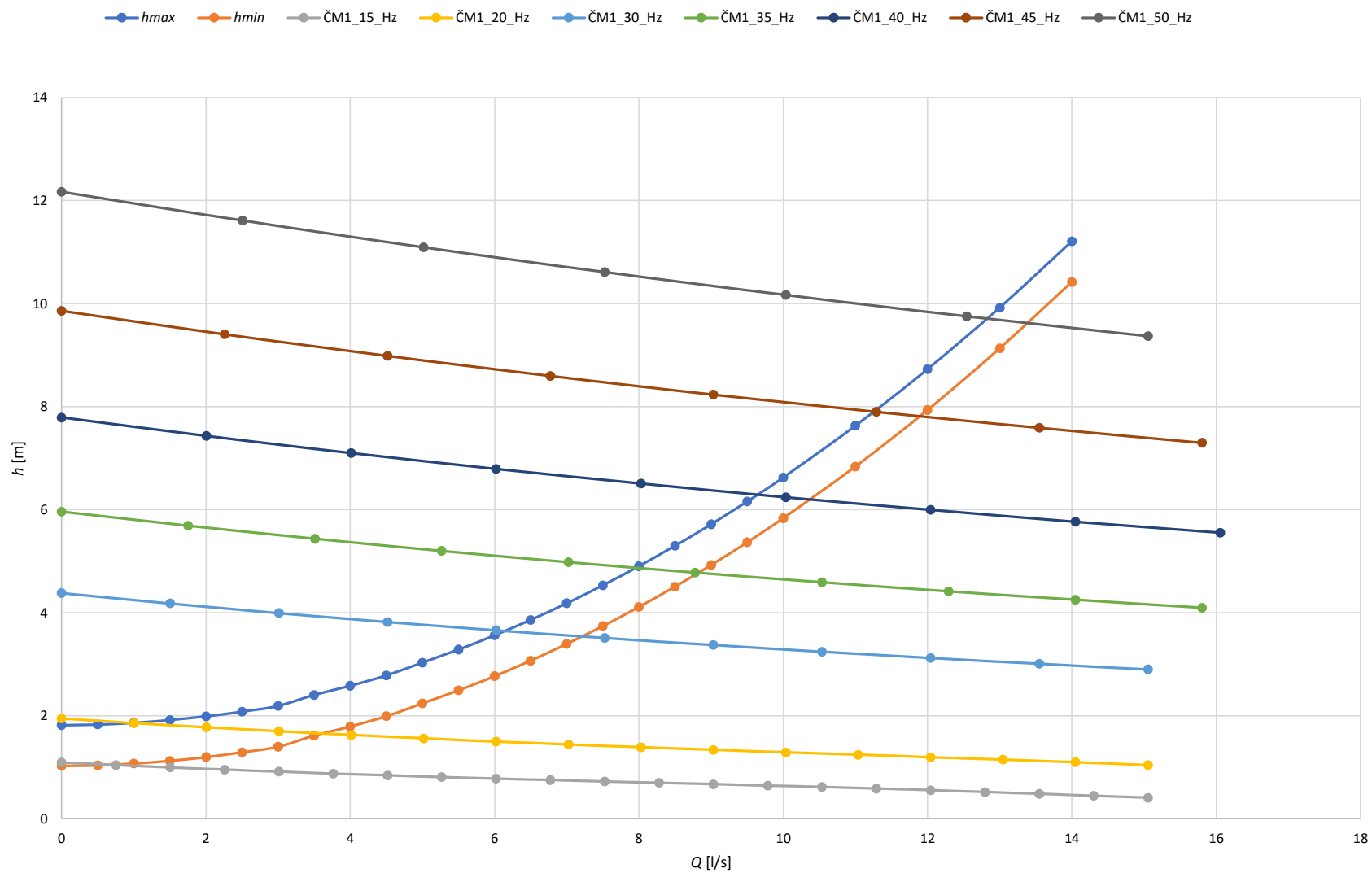
#### Výsledná tabulka

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{max}$	$h_{min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	1.818	1.028
0.5	0.0005	0.003	0.009	1.830	1.040
1	0.001	0.012	0.034	1.864	1.074
1.5	0.0015	0.024	0.075	1.917	1.127
2	0.002	0.040	0.132	1.989	1.199
2.5	0.0025	0.058	0.205	2.081	1.291
3	0.003	0.080	0.293	2.192	1.402
3.5	0.0035	0.190	0.398	2.406	1.616
4	0.004	0.247	0.518	2.583	1.793
4.5	0.0045	0.311	0.655	2.783	1.993
5	0.005	0.407	0.807	3.032	2.242
5.5	0.0055	0.492	0.974	3.284	2.494
6	0.006	0.584	1.158	3.560	2.770
6.5	0.0065	0.685	1.357	3.860	3.070
7	0.007	0.794	1.572	4.184	3.394
7.5	0.0075	0.910	1.803	4.532	3.742
8	0.008	1.035	2.050	4.903	4.113
8.5	0.0085	1.168	2.312	5.298	4.508
9	0.009	1.308	2.590	5.717	4.927
9.5	0.0095	1.457	2.884	6.159	5.369
Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{max}$	$h_{min}$



[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
10	0.01	1.613	3.194	6.625	5.835
11	0.011	1.951	3.860	7.629	6.839
12	0.012	2.320	4.589	8.727	7.937
13	0.013	2.723	5.381	9.922	9.132
14	0.014	3.156	6.236	11.211	10.421

Q-h charakteristika potrubí a čerpadel "ČM1-R5" - (0 - 14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5		X	
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

$L_{DN200}$	9.625	m
$L_{DN150}$	1.901	m

Rozsah průtoků v připojovacím bodě:

R5 - Velké průtoky (0-60) l/s

Čerpadlo - ČM1

	$\zeta$				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
T kus změna směru 90°					1.040
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
Koleno 90°					0.340
Pryžový kompenzátor					0.071
Nožové šoupátko					0.040
T kus změna směru 90°					1.040
$\Sigma$	0	0	0.340	1.323	4.006

### Potrubi DN200

Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.005

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.003	0.012
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.005	0.021
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.007	0.032
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.010	0.047
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.018	0.063
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.023	0.083
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.029	0.105
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.036	0.129
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.043	0.156
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.051	0.186
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.060	0.219
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.069	0.253
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.079	0.291
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.090	0.331
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.101	0.374
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.113	0.419
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.126	0.467
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.139	0.517
52.5	0.053	1.671	321170	0.0400	0.0222	0.0224	0.0224	0.154	0.570
55.0	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.168	0.626
57.5	0.058	1.830	351758	0.0400	0.0222	0.0224	0.0224	0.184	0.684
60.0	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.200	0.745

#### Potrubi DN150

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225
52.5	0.053	2.971	428227	0.0400	0.0238	0.0238	0.0238	0.136	1.330
55.0	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.149	1.439
57.5	0.058	3.254	469011	0.0400	0.0237	0.0238	0.0238	0.163	1.551
60.0	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.177	1.667

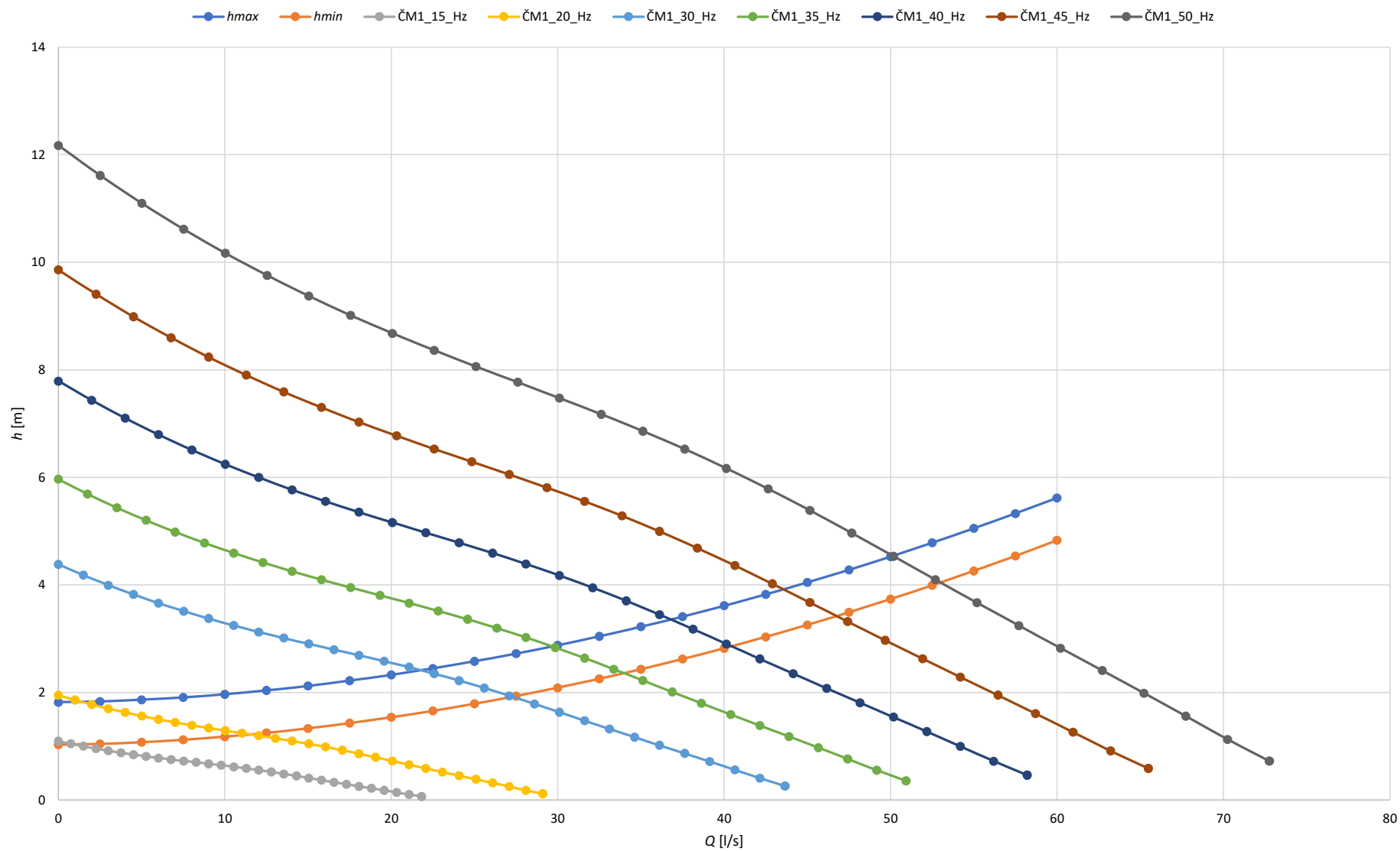
#### Potrubi DN100

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702
52.5	0.053	6.685	0.774
55.0	0.055	7.003	0.850
57.5	0.058	7.321	0.929
60.0	0.060	7.639	1.011

### Výsledná tabulka

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	1.818	1.028
2.5	0.0025	0.001	0.014	1.833	1.043
5	0.005	0.003	0.043	1.863	1.073
7.5	0.0075	0.005	0.085	1.908	1.118
10	0.01	0.009	0.138	1.965	1.175
12.5	0.0125	0.015	0.204	2.037	1.247
15	0.015	0.022	0.280	2.120	1.330
17.5	0.0175	0.034	0.367	2.219	1.429
20	0.02	0.044	0.466	2.327	1.537
22.5	0.0225	0.055	0.574	2.447	1.657
25	0.025	0.067	0.693	2.579	1.789
27.5	0.0275	0.081	0.823	2.722	1.932
30	0.03	0.096	0.963	2.877	2.087
32.5	0.0325	0.113	1.113	3.043	2.253
35	0.035	0.130	1.273	3.221	2.431
37.5	0.0375	0.149	1.443	3.410	2.620
40	0.04	0.169	1.623	3.611	2.821
42.5	0.0425	0.191	1.814	3.822	3.032
45	0.045	0.214	2.014	4.046	3.256
47.5	0.0475	0.238	2.224	4.280	3.490
50	0.05	0.263	2.444	4.525	3.735
52.5	0.0525	0.290	2.674	4.782	3.992
55	0.055	0.317	2.914	5.050	4.260
57.5	0.0575	0.347	3.164	5.328	4.538
60	0.06	0.377	3.423	5.618	4.828

Q-h charakteristika potrubí a čerpadel "ČM1-R5" - (0 - 60) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Přípojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			X
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

**Rozsah průtoků v přípojovacím bodě:**

**R5 - Velké průtoky (0-100) l/s**

**Čerpadlo - ČM1+ČM2**

ČM1	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
T kus (M1+M2) směr od M1					0.430
Σ	0	0	0.340	0.963	1.688
ČM2	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus (M1+M2) směr od M2					0.460
Σ	0	0	0.340	0.963	0.678



ČM1+ČM2	$\zeta$				
Singularity	DN40	DN50	DN100	DN150	DN200
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Koleno 90°					0.340
Nožové šoupátko					0.040
Pryžový kompenzátor					0.071
T kus změna směru 90°					1.040
$\Sigma$	0	0	0	0.360	2.748
DÉLKY ČM1			DÉLKY ČM2		DÉLKY ČM1+ČM2
$L_{DN200}$	0.244 m	$L_{DN200}$	m		$L_{DN200}$ 8.637 m
$L_{DN150}$	0.699 m	$L_{DN150}$	0.699 m		$L_{DN150}$ 1.202 m

#### Potrubí DN200

ČM1									
Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.002
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.005
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.000	0.009
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.000	0.014
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.000	0.020
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.000	0.027
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.001	0.035
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.001	0.044
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.001	0.054
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.001	0.066
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.001	0.078
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.002	0.092
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.002	0.107
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.002	0.123
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.002	0.139
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.003	0.157
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.003	0.176
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.003	0.197
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.004	0.218

ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.000
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.001
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.002
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.000	0.004
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.000	0.005
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.000	0.008
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.000	0.011
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.000	0.014
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.000	0.018
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.000	0.022
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.000	0.026
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.000	0.032
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.000	0.037
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.000	0.043
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.000	0.049
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.000	0.056
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.000	0.063
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.000	0.071
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.000	0.079
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.000	0.088
ČM1+ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.004
10	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.004	0.014
15	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.009	0.032
20	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.021	0.057
25	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.032	0.089
30	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.046	0.128
35	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.062	0.174
40	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.081	0.227
45	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.102	0.287
50	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.125	0.355
55	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.151	0.429
60	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.179	0.511
65	0.065	2.069	397639	0.0400	0.0222	0.0223	0.0223	0.210	0.600
70	0.070	2.228	428227	0.0400	0.0221	0.0223	0.0223	0.243	0.695
75	0.075	2.387	458815	0.0400	0.0221	0.0222	0.0222	0.279	0.798

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
80	0.080	2.546	489402	0.0400	0.0221	0.0222	0.0222	0.317	0.908
85	0.085	2.706	519990	0.0400	0.0221	0.0222	0.0222	0.357	1.025
90	0.090	2.865	550578	0.0400	0.0220	0.0221	0.0221	0.400	1.150
95	0.095	3.024	581165	0.0400	0.0220	0.0221	0.0221	0.445	1.281
100	0.100	3.183	611753	0.0400	0.0220	0.0221	0.0221	0.493	1.419

#### Potrubi DN150

##### ČM1

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.010
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.000	0.029
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.054
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.001	0.084
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.003	0.118
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.004	0.157
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.006	0.200
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.007	0.247
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.009	0.297
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.012	0.352
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.014	0.409
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.017	0.471
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.019	0.535
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.022	0.603
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.026	0.674
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.029	0.749
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.033	0.826
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.037	0.907
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.041	0.991
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.045	1.078

##### ČM2

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.010
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.000	0.029
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.054
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.001	0.084
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.003	0.118
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.004	0.157
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.006	0.200

Q	Q	v150	Re150	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.007	0.247
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.009	0.297
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.012	0.352
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.014	0.409
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.017	0.471
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.019	0.535
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.022	0.603
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.026	0.674
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.029	0.749
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.033	0.826
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.037	0.907
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.041	0.991
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.045	1.078
<b>ČM1+ČM2</b>									
Q	Q	v150	Re150	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
5	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.001
10	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.002	0.006
15	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.007	0.013
20	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.013	0.024
25	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.020	0.037
30	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.028	0.053
35	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.039	0.072
40	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.050	0.094
45	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.063	0.119
50	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.078	0.147
55	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.094	0.178
60	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.112	0.212
65	0.065	3.678	530186	0.0400	0.0237	0.0238	0.0238	0.131	0.248
70	0.070	3.961	570969	0.0400	0.0237	0.0237	0.0237	0.152	0.288
75	0.075	4.244	611753	0.0400	0.0237	0.0237	0.0237	0.175	0.331
80	0.080	4.527	652536	0.0400	0.0236	0.0237	0.0237	0.198	0.376
85	0.085	4.810	693320	0.0400	0.0236	0.0237	0.0237	0.224	0.425
90	0.090	5.093	734103	0.0400	0.0236	0.0237	0.0237	0.251	0.476
95	0.095	5.376	774887	0.0400	0.0236	0.0237	0.0237	0.279	0.530
100	0.100	5.659	815670	0.0400	0.0236	0.0236	0.0236	0.309	0.588

**Potrubí DN100**

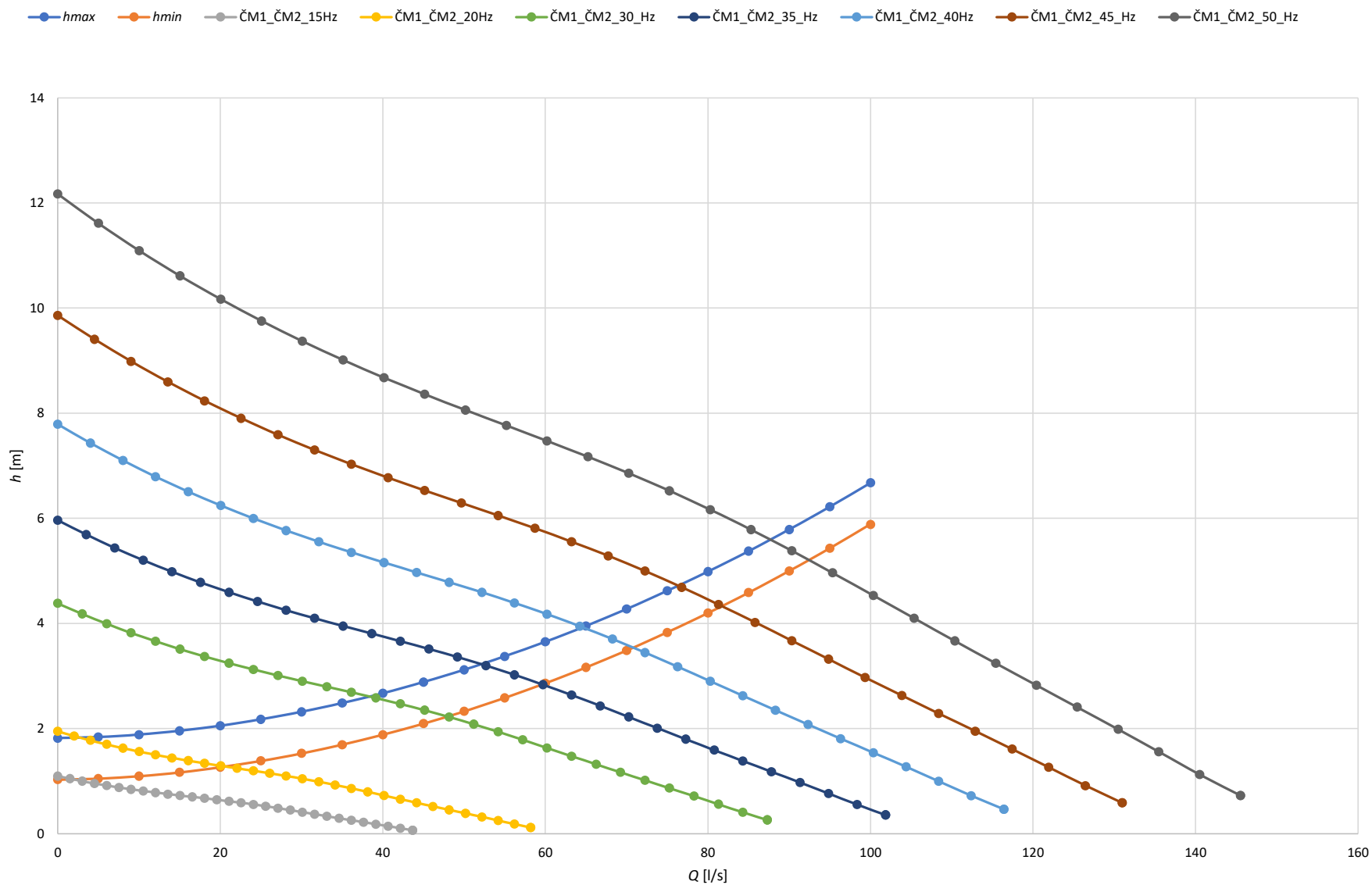
ČM1				ČM2			
Q	Q	v <sub>100</sub>	h <sub>m100</sub>	Q	Q	v <sub>100</sub>	h <sub>m100</sub>
[l/s]	[m³/s]	[m/s]	[m]	[l/s]	[m³/s]	[m/s]	[m]
0	0	0	0	0	0	0	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569	45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.6339	47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.7023	50.0	0.050	6.366	0.702

**Výsledná tabulka**

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m³/s]	[m]	[m]	[m]	[m]
0	0	0.000	0.000	1.818	1.028
5	0.005	0.002	0.018	1.838	1.048
10	0.010	0.007	0.058	1.884	1.094
15	0.015	0.017	0.120	1.955	1.165
20	0.020	0.035	0.201	2.054	1.264
25	0.025	0.055	0.301	2.175	1.385
30	0.030	0.079	0.421	2.317	1.527
35	0.035	0.107	0.559	2.484	1.694
40	0.040	0.139	0.715	2.672	1.882
45	0.045	0.175	0.890	2.883	2.093
50	0.050	0.216	1.083	3.117	2.327
55	0.055	0.260	1.295	3.373	2.583
60	0.060	0.309	1.524	3.652	2.862
65	0.065	0.362	1.772	3.952	3.162
70	0.070	0.419	2.038	4.275	3.485
75	0.075	0.481	2.321	4.620	3.830

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
80	0.080	0.547	2.622	4.987	4.197
85	0.085	0.616	2.941	5.376	4.586
90	0.090	0.690	3.278	5.787	4.997
95	0.095	0.769	3.633	6.219	5.429
100	0.100	0.851	4.005	6.674	5.884

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-R5" - (0 - 100) l/s



## Směr čerpaného množství a použité čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6	X		
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Délky:

L <sub>DN200</sub>	0.600	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.237	m
L <sub>DN40</sub>	0.493	m

Rozsah průtoků v připojovacím bodě:

R6 - Malé průtoky (0-14) l/s

Čerpadlo - ČM1

	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
T kus změna směru 90°	1.04				
Kulový ventil DN 40	0.100				
Σ	1.440	0.840	0.340	1.263	1.258



**Potrubí DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.043	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.036	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.032	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.030	0.000	0.000
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.028	0.000	0.000
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.027	0.000	0.001
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.026	0.000	0.001
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.025	0.000	0.001
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.025	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.024	0.000	0.002
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.023	0.000	0.002
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.023	0.000	0.002
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.022	0.000	0.003
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.022	0.000	0.003
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.022	0.000	0.004
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.021	0.000	0.004
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.021	0.000	0.005
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.021	0.000	0.005
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.020	0.000	0.006
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.020	0.000	0.006
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.020	0.000	0.008
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.019	0.000	0.009
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.019	0.000	0.011
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.018	0.001	0.013

**Potrubí DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.040	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.033	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.030	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.028	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.026	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.025	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.024	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.024	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.023	0.001	0.026

Q	Q	$v_{150}$	$Re_{150}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.022	0.001	0.030
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.022	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.021	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.021	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.020	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.020	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.020	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.019	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.019	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.019	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.019	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.018	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.018	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.025	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.025	0.009	0.151

#### Potrubí DN50

Q	Q	$v_{50}$	$Re_{50}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{50}$	$h_{t50}$	$h_{m50}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.031	0.000	0.002
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.026	0.001	0.007
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.024	0.002	0.016
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.022	0.003	0.028
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.021	0.004	0.043
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.020	0.006	0.062
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.019	0.008	0.085
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.018	0.010	0.111
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.018	0.013	0.140
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.032	0.028	0.173
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.032	0.033	0.209
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.032	0.039	0.249
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.032	0.046	0.292
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.032	0.054	0.339
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.032	0.061	0.389
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.031	0.070	0.442
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.031	0.079	0.499
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.031	0.088	0.560
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.031	0.098	0.623
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.031	0.109	0.691
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.031	0.131	0.836
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.031	0.156	0.995
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.031	0.183	1.167
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.031	0.212	1.354

**Potrubí DN40**

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.002	0.010
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.008	0.039
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.016	0.087
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.026	0.154
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.038	0.241
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.052	0.347
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.134	0.473
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.175	0.618
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.220	0.782
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.272	0.965
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.328	1.168
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.390	1.390
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.458	1.631
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.530	1.892
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.608	2.171
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.692	2.471
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	0.781	2.789
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	0.875	3.127
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	0.974	3.484
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.079	3.860
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.305	4.671
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.552	5.559
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	1.820	6.524
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.110	7.566

**Potrubí DN100**

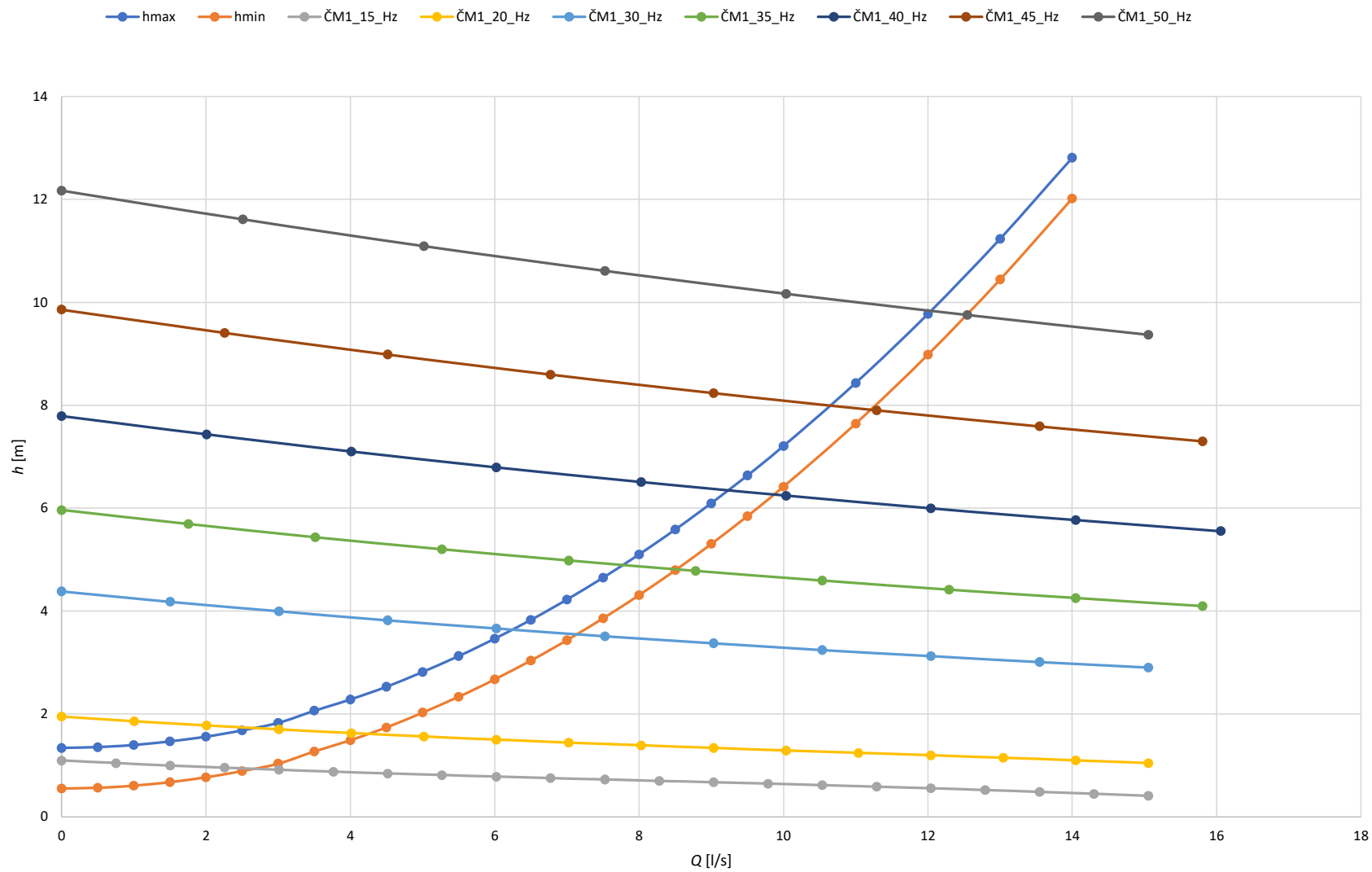
Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0.000	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012

Q	Q	V <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

#### Výsledná tabulka

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0.000	0.000	1.340	0.550
0.5	0.001	0.003	0.012	1.355	0.565
1.0	0.001	0.009	0.049	1.397	0.607
1.5	0.002	0.017	0.108	1.466	0.676
2.0	0.002	0.029	0.191	1.560	0.770
2.5	0.003	0.043	0.297	1.680	0.890
3.0	0.003	0.059	0.427	1.825	1.035
3.5	0.004	0.143	0.579	2.062	1.272
4.0	0.004	0.186	0.755	2.281	1.491
4.5	0.005	0.234	0.954	2.528	1.738
5.0	0.005	0.300	1.177	2.817	2.027
5.5	0.006	0.363	1.422	3.125	2.335
6.0	0.006	0.431	1.691	3.462	2.672
6.5	0.007	0.506	1.983	3.829	3.039
7.0	0.007	0.586	2.298	4.224	3.434
7.5	0.008	0.672	2.636	4.648	3.858
8.0	0.008	0.764	2.998	5.102	4.312
8.5	0.009	0.862	3.382	5.584	4.794
9.0	0.009	0.966	3.790	6.096	5.306
9.5	0.010	1.076	4.221	6.636	5.846
10.0	0.010	1.191	4.674	7.206	6.416
11.0	0.011	1.440	5.652	8.432	7.642
12.0	0.012	1.713	6.722	9.775	8.985
13.0	0.013	2.012	7.884	11.236	10.446
14.0	0.014	2.332	9.139	12.811	12.021

Q-h charakteristika potrubí a čerpadel "ČM1-R6" - (0 - 14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1	X		
Měrný žlab Ž2			

### Výpočty:

Rozsah průtoků v připojovacím bodě:

Ž1 - Malé průtoky (0-14) l/s

Čerpadlo - ČM1

Délky:

L <sub>DN200</sub>	7.223	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.474	m
L <sub>DN40</sub>	0.634	m

ζ					
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
T kus změna směru 90°					1.04
Nožové šoupátko					0.04
Pryžový kompenzátor					0.07072
Koleno 90°					0.34
Vtok do žlabu					1.000
Σ	0.400	2.414	0.340	1.263	3.748

**Potrubí  
DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.043	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.036	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.032	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.030	0.000	0.001
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.028	0.000	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.027	0.000	0.002
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.026	0.001	0.002
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.025	0.001	0.003
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.025	0.001	0.004
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.024	0.001	0.005
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.023	0.001	0.006
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.023	0.002	0.007
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.022	0.002	0.008
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.022	0.002	0.009
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.022	0.002	0.011
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.021	0.003	0.012
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.021	0.003	0.014
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.021	0.003	0.016
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.020	0.003	0.017
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.020	0.004	0.019
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.020	0.004	0.023
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.019	0.005	0.028
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.019	0.006	0.033
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.018	0.007	0.038

**Potrubí  
DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.040	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.033	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.030	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.028	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.026	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.025	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.024	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.024	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.023	0.001	0.026
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.022	0.001	0.030

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.022	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.021	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.021	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.020	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.020	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.020	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.019	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.019	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.019	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.019	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.018	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.018	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.025	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.025	0.009	0.151

#### Potrubí DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.031	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.026	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.024	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.022	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.021	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.020	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.019	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.018	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.018	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.032	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.032	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.032	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.032	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.032	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.032	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.031	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.031	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.031	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.031	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.031	0.217	1.985
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.031	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.031	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.031	0.366	3.355
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.031	0.424	3.890



**Potrubí DN40**

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.715	2.102

**Potrubí  
DN100**

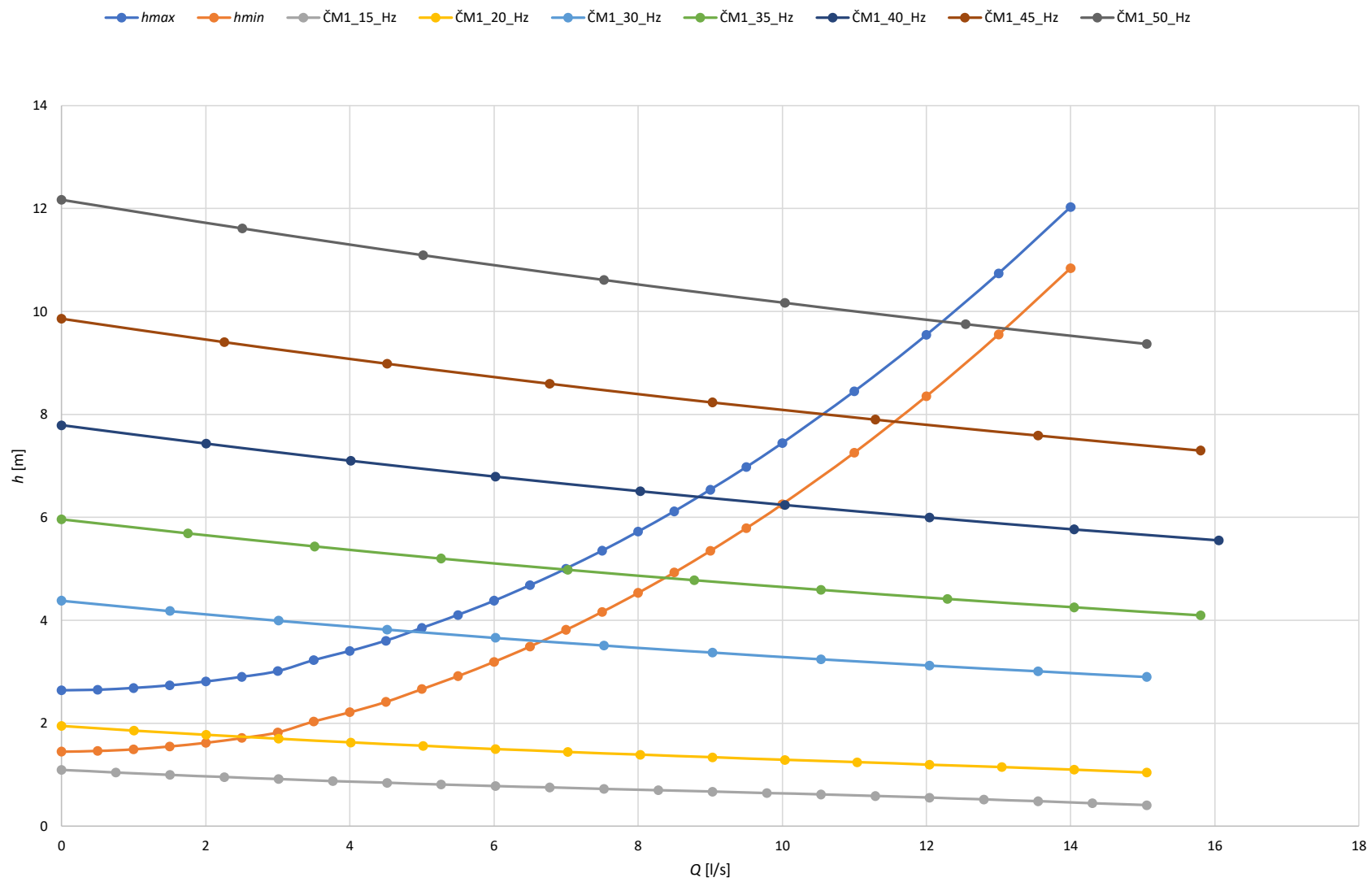
Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0.000	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008

Q	Q	V <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

#### Výsledná tabulka

Q	Q	Σh <sub>i</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0.000	0.000	2.640	1.450
0.5	0.001	0.003	0.009	2.652	1.462
1.0	0.001	0.012	0.034	2.686	1.496
1.5	0.002	0.024	0.075	2.739	1.549
2.0	0.002	0.040	0.132	2.811	1.621
2.5	0.003	0.058	0.205	2.903	1.713
3.0	0.003	0.080	0.293	3.014	1.824
3.5	0.004	0.190	0.398	3.228	2.038
4.0	0.004	0.246	0.518	3.405	2.215
4.5	0.005	0.310	0.655	3.605	2.415
5.0	0.005	0.407	0.807	3.853	2.663
5.5	0.006	0.491	0.974	4.106	2.916
6.0	0.006	0.584	1.158	4.382	3.192
6.5	0.007	0.685	1.357	4.682	3.492
7.0	0.007	0.793	1.572	5.005	3.815
7.5	0.008	0.910	1.803	5.353	4.163
8.0	0.008	1.034	2.050	5.724	4.534
8.5	0.009	1.167	2.312	6.119	4.929
9.0	0.009	1.307	2.590	6.538	5.348
9.5	0.010	1.456	2.884	6.980	5.790
10.0	0.010	1.612	3.193	7.446	6.256
11.0	0.011	1.949	3.860	8.449	7.259
12.0	0.012	2.318	4.589	9.547	8.357
13.0	0.013	2.721	5.381	10.742	9.552
14.0	0.014	3.155	6.236	12.031	10.841

Q-h charakteristika potrubí a čerpadel "ČM1-Ž1" - (0 - 14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1		X	
Měrný žlab Ž2			

### Výpočty:

Rozsah průtoků v připojovacím bodě:

Ž1 - Velké průtoky (0-60) l/s

Čerpadlo - ČM1

Délky:

L200	7.707	m
L150	1.901	m

	$\zeta$				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
T kus změna směru 90°					1.040
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
Koleno 90°					0.340
Pryžový kompenzátor					0.071
Nožové šoupátko					0.040
Vtok do žlabu					1.000
$\Sigma$	0	0	0.340	1.323	3.966

### Potrubí DN200

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.005
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.002	0.012
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.004	0.020
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.006	0.032
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.008	0.046
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.014	0.063
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.019	0.082
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.023	0.104
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.029	0.128
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.035	0.155
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.041	0.184
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.048	0.216
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.055	0.251
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.063	0.288
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.072	0.328
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.081	0.370
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.091	0.415
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.101	0.462
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.112	0.512
52.5	0.053	1.671	321170	0.0400	0.0222	0.0224	0.0224	0.123	0.565
55.0	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.135	0.620
57.5	0.058	1.830	351758	0.0400	0.0222	0.0224	0.0224	0.147	0.677
60.0	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.160	0.737

#### Potrubí DN150

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225
52.5	0.053	2.971	428227	0.0400	0.0238	0.0238	0.0238	0.136	1.330
55.0	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.149	1.439
57.5	0.058	3.254	469011	0.0400	0.0237	0.0238	0.0238	0.163	1.551
60.0	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.177	1.667

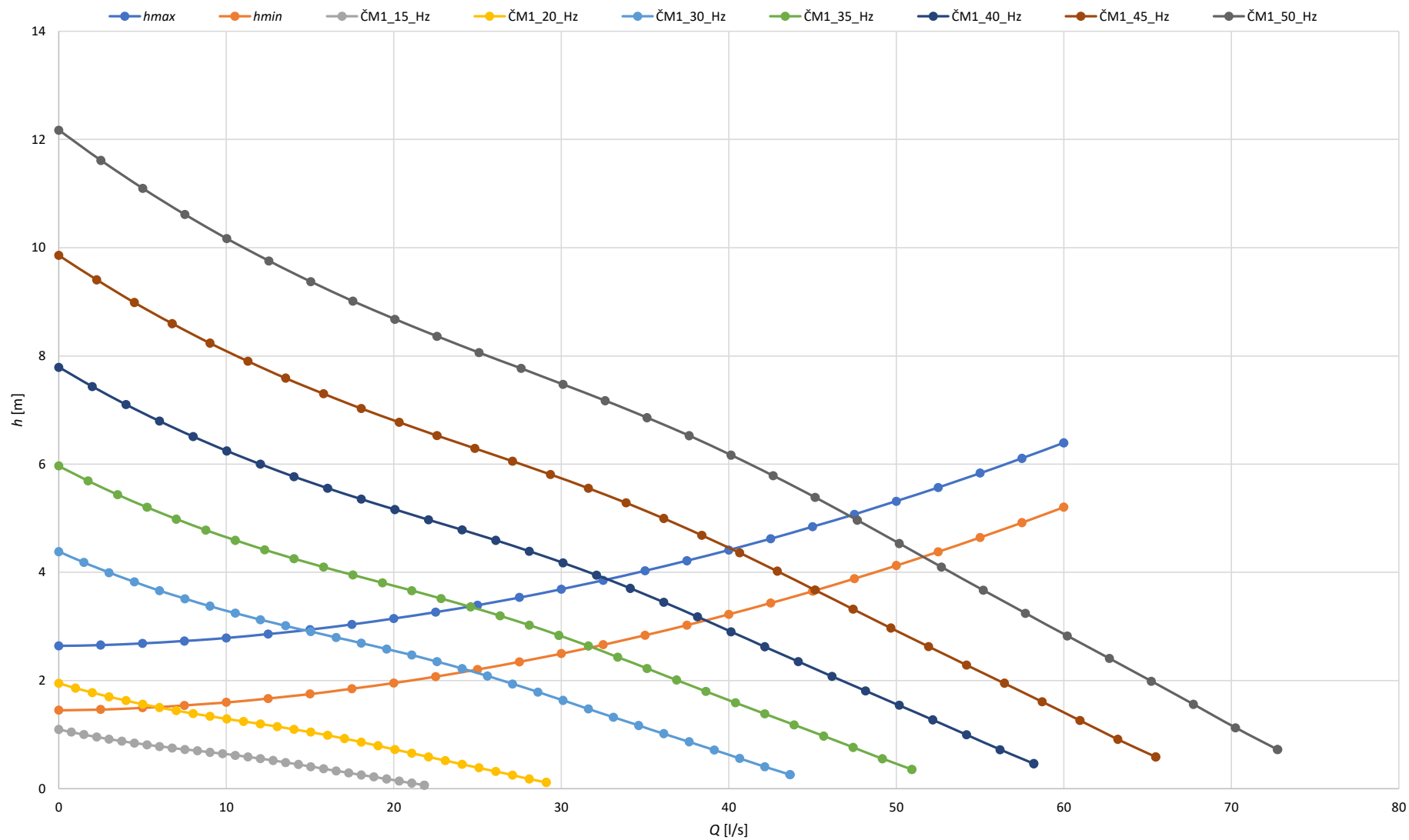
#### Potrubi DN100

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702
52.5	0.053	6.685	0.774
55.0	0.055	7.003	0.850
57.5	0.058	7.321	0.929
60.0	0.060	7.639	1.011

### Výsledná tabulka

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	2.640	1.450
2.5	0.003	0.001	0.014	2.654	1.464
5.0	0.005	0.002	0.043	2.685	1.495
7.5	0.008	0.005	0.085	2.729	1.539
10.0	0.010	0.008	0.138	2.786	1.596
12.5	0.013	0.014	0.203	2.857	1.667
15.0	0.015	0.020	0.280	2.939	1.749
17.5	0.018	0.030	0.367	3.037	1.847
20.0	0.020	0.039	0.465	3.144	1.954
22.5	0.023	0.049	0.573	3.262	2.072
25.0	0.025	0.060	0.692	3.392	2.202
27.5	0.028	0.072	0.821	3.534	2.344
30.0	0.030	0.086	0.961	3.687	2.497
32.5	0.033	0.101	1.110	3.851	2.661
35.0	0.035	0.116	1.270	4.027	2.837
37.5	0.038	0.133	1.440	4.213	3.023
40.0	0.040	0.151	1.620	4.411	3.221
42.5	0.043	0.171	1.810	4.621	3.431
45.0	0.045	0.191	2.010	4.841	3.651
47.5	0.048	0.212	2.220	5.072	3.882
50.0	0.050	0.235	2.439	5.314	4.124
52.5	0.053	0.259	2.669	5.568	4.378
55.0	0.055	0.284	2.908	5.832	4.642
57.5	0.058	0.310	3.157	6.107	4.917
60.0	0.060	0.337	3.416	6.393	5.203

Q-h charakteristika potrubí a čerpadel "ČM1-Ž1" - (0 - 60) l/s





## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Přípojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			X
Měrný žlab Ž2			

### Výpočty:

**Rozsah průtoků v přípojovacím**

**bodě:**

**Ž1 - Velké průtoky (0-100)**

**l/s**

**Čerpadlo - ČM1+ČM2**

ČM1	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
T kus (M1+M2) směr od M1					0.430
Σ	0	0	0.340	0.963	1.688
ČM2	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus (M1+M2) směr od M2					0.460
Σ	0	0	0.340	0.963	0.678

ČM1+ČM2		$\zeta$				
Singularity		DN40	DN50	DN100	DN150	DN200
Zúžení z DN 200 na DN 150					0.200	
Indukční průtokoměr DN 150					0.100	
Nožové šoupátko					0.06	
Rozšíření z DN 150 na DN 200						0.218
T kus změna směru 90°						1.040
Koleno 90°						0.340
Nožové šoupátko						0.040
Pryžový kompenzátor						0.071
Vtok do žlabu						1.000
$\Sigma$		0	0	0	0.360	2.708
DÉLKY ČM1			DÉLKY ČM2			DÉLKY ČM1+ČM2
$L_{DN200}$	0.244	m	$L_{DN200}$		m	$L_{DN200}$ 6.719 m
$L_{DN150}$	0.699	m	$L_{DN150}$	0.699	m	$L_{DN150}$ 1.202 m

#### Potrubí DN200

ČM1									
Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.002
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.005
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.000	0.009
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.000	0.014
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.000	0.020
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.000	0.027
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.001	0.035
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.001	0.044
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.001	0.054
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.001	0.066
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.001	0.078
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.002	0.092
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.002	0.107
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.002	0.123
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.002	0.139
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.003	0.157
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.003	0.176
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.003	0.197
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.004	0.218

ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>l200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.000
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.001
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.002
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.000	0.004
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.000	0.005
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.000	0.008
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.000	0.011
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.000	0.014
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.000	0.018
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.000	0.022
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.000	0.026
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.000	0.032
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.000	0.037
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.000	0.043
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.000	0.049
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.000	0.056
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.000	0.063
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.000	0.071
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.000	0.079
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.000	0.088
ČM1+ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>l200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.003
10	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.003	0.014
15	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.007	0.031
20	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.016	0.056
25	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.025	0.087
30	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.036	0.126
35	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.048	0.171
40	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.063	0.224
45	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.079	0.283
50	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.097	0.350
55	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.117	0.423
60	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.140	0.504
65	0.065	2.069	397639	0.0400	0.0222	0.0223	0.0223	0.163	0.591
70	0.070	2.228	428227	0.0400	0.0221	0.0223	0.0223	0.189	0.685
75	0.075	2.387	458815	0.0400	0.0221	0.0222	0.0222	0.217	0.787

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
80	0.080	2.546	489402	0.0400	0.0221	0.0222	0.0222	0.246	0.895
85	0.085	2.706	519990	0.0400	0.0221	0.0222	0.0222	0.278	1.011
90	0.090	2.865	550578	0.0400	0.0220	0.0221	0.0221	0.311	1.133
95	0.095	3.024	581165	0.0400	0.0220	0.0221	0.0221	0.346	1.262
100	0.100	3.183	611753	0.0400	0.0220	0.0221	0.0221	0.383	1.399

### Potrubi DN150

#### ČM1

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.010
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.000	0.029
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.054
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.001	0.084
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.003	0.118
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.004	0.157
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.006	0.200
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.007	0.247
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.009	0.297
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.012	0.352
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.014	0.409
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.017	0.471
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.019	0.535
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.022	0.603
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.026	0.674
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.029	0.749
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.033	0.826
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.037	0.907
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.041	0.991
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.045	1.078

#### ČM2

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.010
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.000	0.029
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.054
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.001	0.084
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.003	0.118
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.004	0.157
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.006	0.200

Q	Q	v150	Re150	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.007	0.247
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.009	0.297
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.012	0.352
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.014	0.409
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.017	0.471
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.019	0.535
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.022	0.603
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.026	0.674
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.029	0.749
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.033	0.826
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.037	0.907
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.041	0.991
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.045	1.078
<b>ČM1+ČM2</b>									
Q	Q	v150	Re150	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
5	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.001
10	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.002	0.006
15	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.007	0.013
20	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.013	0.024
25	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.020	0.037
30	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.028	0.053
35	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.039	0.072
40	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.050	0.094
45	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.063	0.119
50	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.078	0.147
55	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.094	0.178
60	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.112	0.212
65	0.065	3.678	530186	0.0400	0.0237	0.0238	0.0238	0.131	0.248
70	0.070	3.961	570969	0.0400	0.0237	0.0237	0.0237	0.152	0.288
75	0.075	4.244	611753	0.0400	0.0237	0.0237	0.0237	0.175	0.331
80	0.080	4.527	652536	0.0400	0.0236	0.0237	0.0237	0.198	0.376
85	0.085	4.810	693320	0.0400	0.0236	0.0237	0.0237	0.224	0.425
90	0.090	5.093	734103	0.0400	0.0236	0.0237	0.0237	0.251	0.476
95	0.095	5.376	774887	0.0400	0.0236	0.0237	0.0237	0.279	0.530
100	0.100	5.659	815670	0.0400	0.0236	0.0236	0.0236	0.309	0.588

**Potrubí DN100**

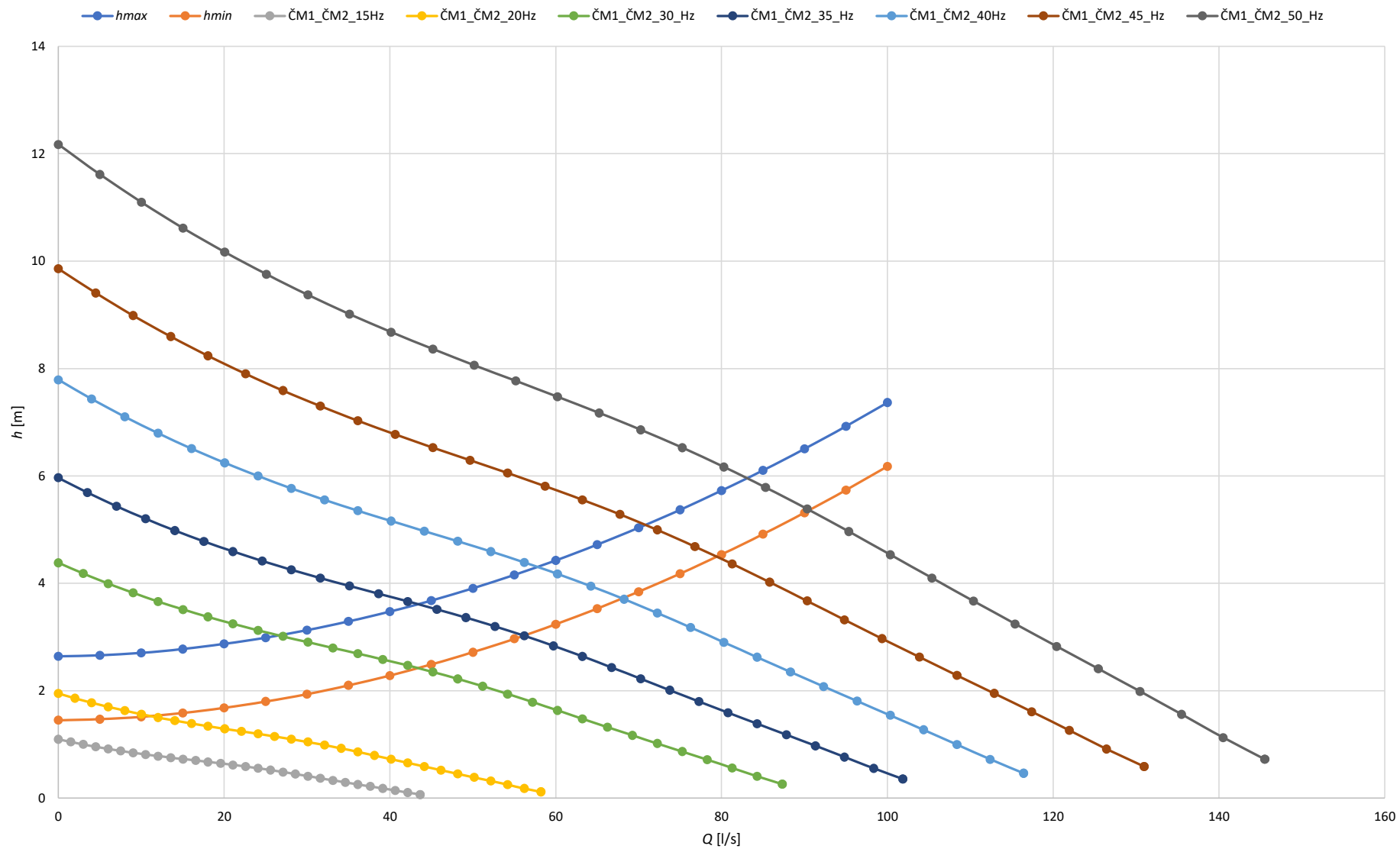
ČM1				ČM2			
Q	Q	v <sub>40</sub>	h <sub>m100</sub>	Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m³/s]	[m/s]	[m]	[l/s]	[m³/s]	[m/s]	[m]
0	0	0.000	0.000	0	0	0.000	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569	45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.6339	47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.7023	50.0	0.050	6.366	0.702

**Výsledná tabulka**

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m³/s]	[m]	[m]	[m]	[m]
0	0	0.000	0.000	2.640	1.450
5	0.005	0.002	0.018	2.659	1.469
10	0.010	0.006	0.058	2.705	1.515
15	0.015	0.015	0.119	2.775	1.585
20	0.020	0.031	0.200	2.871	1.681
25	0.025	0.048	0.300	2.988	1.798
30	0.030	0.069	0.419	3.127	1.937
35	0.035	0.093	0.556	3.289	2.099
40	0.040	0.121	0.712	3.473	2.283
45	0.045	0.153	0.886	3.679	2.489
50	0.050	0.188	1.078	3.906	2.716
55	0.055	0.227	1.289	4.155	2.965
60	0.060	0.269	1.517	4.426	3.236
65	0.065	0.316	1.763	4.719	3.529
70	0.070	0.365	2.027	5.033	3.843
75	0.075	0.419	2.309	5.368	4.178

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
80	0.080	0.476	2.609	5.725	4.535
85	0.085	0.537	2.926	6.104	4.914
90	0.090	0.602	3.261	6.503	5.313
95	0.095	0.670	3.614	6.924	5.734
100	0.100	0.742	3.984	7.366	6.176

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-Ž1" - (0 - 100) l/s





## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

### Výpočty:

Rozsah průtoků v připojovacím bodě:

Ž2 - Malé průtoky (0-14) l/s

Čerpadlo - ČM1

Délky:

L <sub>DN200</sub>	9.265	m
L <sub>DN150</sub>	1.676	m
L <sub>DN50</sub>	0.474	m
L <sub>DN40</sub>	0.634	m

ζ					
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
Vtok do Bypassu DN 50		0.500			
Koleno 90°		0.340			
Zúžení z DN 50 na DN 40	0.200				
Indukční průtokoměr DN 40	0.100				
Kulový ventil DN 40	0.100				
Rozšíření z DN 40 na DN50		0.234			
Koleno 90°		0.340			
Výtok z Bypassu DN 50		1.000			
T kus změna směru 90°					1.04
Nožové šoupátko					0.04
Pryžový kompenzátor					0.07072
Koleno 90°					0.34
Vtok do žlabu					1.000
Σ	0.400	2.414	0.340	1.263	3.748

**Potrubí  
DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.016	3059	0.0400	0.0425	0.0425	0.043	0.000	0.000
1.0	0.001	0.032	6118	0.0400	0.0358	0.0358	0.036	0.000	0.000
1.5	0.002	0.048	9176	0.0400	0.0323	0.0323	0.032	0.000	0.000
2.0	0.002	0.064	12235	0.0400	0.0301	0.0301	0.030	0.000	0.001
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.028	0.000	0.001
3.0	0.003	0.095	18353	0.0400	0.0272	0.0272	0.027	0.001	0.002
3.5	0.004	0.111	21411	0.0400	0.0262	0.0262	0.026	0.001	0.002
4.0	0.004	0.127	24470	0.0400	0.0253	0.0253	0.025	0.001	0.003
4.5	0.005	0.143	27529	0.0400	0.0246	0.0246	0.025	0.001	0.004
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.024	0.001	0.005
5.5	0.006	0.175	33646	0.0400	0.0234	0.0234	0.023	0.002	0.006
6.0	0.006	0.191	36705	0.0400	0.0229	0.0229	0.023	0.002	0.007
6.5	0.007	0.207	39764	0.0400	0.0224	0.0224	0.022	0.002	0.008
7.0	0.007	0.223	42823	0.0400	0.0220	0.0220	0.022	0.003	0.009
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.022	0.003	0.011
8.0	0.008	0.255	48940	0.0400	0.0213	0.0213	0.021	0.003	0.012
8.5	0.009	0.271	51999	0.0400	0.0210	0.0210	0.021	0.004	0.014
9.0	0.009	0.286	55058	0.0400	0.0207	0.0207	0.021	0.004	0.016
9.5	0.010	0.302	58117	0.0400	0.0204	0.0204	0.020	0.004	0.017
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.020	0.005	0.019
11.0	0.011	0.350	67293	0.0400	0.0196	0.0196	0.020	0.006	0.023
12.0	0.012	0.382	73410	0.0400	0.0192	0.0192	0.019	0.007	0.028
13.0	0.013	0.414	79528	0.0400	0.0188	0.0188	0.019	0.008	0.033
14.0	0.014	0.446	85645	0.0400	0.0185	0.0185	0.018	0.009	0.038

**Potrubí  
DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
0.5	0.001	0.028	4078	0.0400	0.0396	0.0396	0.040	0.000	0.001
1.0	0.001	0.057	8157	0.0400	0.0333	0.0333	0.033	0.000	0.003
1.5	0.002	0.085	12235	0.0400	0.0301	0.0301	0.030	0.000	0.005
2.0	0.002	0.113	16313	0.0400	0.0280	0.0280	0.028	0.000	0.008
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.026	0.000	0.011
3.0	0.003	0.170	24470	0.0400	0.0253	0.0253	0.025	0.000	0.014
3.5	0.004	0.198	28548	0.0400	0.0243	0.0243	0.024	0.001	0.018
4.0	0.004	0.226	32627	0.0400	0.0235	0.0235	0.024	0.001	0.022
4.5	0.005	0.255	36705	0.0400	0.0229	0.0229	0.023	0.001	0.026
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.022	0.001	0.030

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
5.5	0.006	0.311	44862	0.0400	0.0217	0.0217	0.022	0.001	0.035
6.0	0.006	0.340	48940	0.0400	0.0213	0.0213	0.021	0.001	0.040
6.5	0.007	0.368	53019	0.0400	0.0209	0.0209	0.021	0.002	0.045
7.0	0.007	0.396	57097	0.0400	0.0205	0.0205	0.020	0.002	0.051
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.020	0.002	0.057
8.0	0.008	0.453	65254	0.0400	0.0198	0.0198	0.020	0.002	0.063
8.5	0.009	0.481	69332	0.0400	0.0195	0.0195	0.019	0.003	0.069
9.0	0.009	0.509	73410	0.0400	0.0192	0.0192	0.019	0.003	0.075
9.5	0.010	0.538	77489	0.0400	0.0190	0.0190	0.019	0.003	0.082
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.019	0.003	0.089
11.0	0.011	0.622	89724	0.0400	0.0183	0.0183	0.018	0.004	0.103
12.0	0.012	0.679	97880	0.0400	0.0179	0.0179	0.018	0.005	0.118
13.0	0.013	0.736	106037	0.0400	0.0247	0.0250	0.025	0.008	0.134
14.0	0.014	0.792	114194	0.0400	0.0246	0.0249	0.025	0.009	0.151

#### Potrubi DN50

Q	Q	v <sub>50</sub>	Re <sub>50</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>50</sub>	h <sub>t50</sub>	h <sub>m50</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.201	10866	0.0400	0.0310	0.0310	0.031	0.001	0.005
1.0	0.001	0.402	21732	0.0400	0.0261	0.0261	0.026	0.002	0.020
1.5	0.002	0.603	32598	0.0400	0.0235	0.0235	0.024	0.004	0.045
2.0	0.002	0.803	43464	0.0400	0.0219	0.0219	0.022	0.006	0.079
2.5	0.003	1.004	54330	0.0400	0.0207	0.0207	0.021	0.009	0.124
3.0	0.003	1.205	65196	0.0400	0.0198	0.0198	0.020	0.012	0.179
3.5	0.004	1.406	76062	0.0400	0.0191	0.0191	0.019	0.016	0.243
4.0	0.004	1.607	86928	0.0400	0.0184	0.0184	0.018	0.020	0.318
4.5	0.005	1.808	97794	0.0400	0.0179	0.0179	0.018	0.025	0.402
5.0	0.005	2.008	108659	0.0400	0.0317	0.0318	0.032	0.055	0.496
5.5	0.006	2.209	119525	0.0400	0.0316	0.0317	0.032	0.066	0.600
6.0	0.006	2.410	130391	0.0400	0.0316	0.0317	0.032	0.079	0.715
6.5	0.007	2.611	141257	0.0400	0.0315	0.0316	0.032	0.092	0.839
7.0	0.007	2.812	152123	0.0400	0.0315	0.0316	0.032	0.107	0.973
7.5	0.008	3.013	162989	0.0400	0.0315	0.0315	0.032	0.123	1.117
8.0	0.008	3.214	173855	0.0400	0.0314	0.0315	0.031	0.140	1.270
8.5	0.009	3.414	184721	0.0400	0.0314	0.0315	0.031	0.157	1.434
9.0	0.009	3.615	195587	0.0400	0.0314	0.0314	0.031	0.176	1.608
9.5	0.010	3.816	206453	0.0400	0.0314	0.0314	0.031	0.196	1.791
10.0	0.010	4.017	217319	0.0400	0.0313	0.0314	0.031	0.217	1.985
11.0	0.011	4.419	239051	0.0400	0.0313	0.0313	0.031	0.263	2.402
12.0	0.012	4.820	260783	0.0400	0.0313	0.0313	0.031	0.312	2.858
13.0	0.013	5.222	282515	0.0400	0.0313	0.0313	0.031	0.366	3.355
14.0	0.014	5.624	304247	0.0400	0.0312	0.0313	0.031	0.424	3.890

**Potrubí DN40**

Q	Q	v <sub>40</sub>	Re <sub>40</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>40</sub>	h <sub>t40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0.000	0	0	0	0	0	0	0
0.5	0.001	0.363	14600	0.040	0.029	0.029	0.029	0.003	0.003
1.0	0.001	0.725	29201	0.040	0.024	0.024	0.024	0.010	0.011
1.5	0.002	1.088	43801	0.040	0.022	0.022	0.022	0.020	0.024
2.0	0.002	1.450	58401	0.040	0.020	0.020	0.020	0.033	0.043
2.5	0.003	1.813	73002	0.040	0.019	0.019	0.019	0.049	0.067
3.0	0.003	2.176	87602	0.040	0.018	0.018	0.018	0.067	0.097
3.5	0.004	2.538	102202	0.040	0.035	0.035	0.035	0.172	0.131
4.0	0.004	2.901	116802	0.040	0.035	0.035	0.035	0.225	0.172
4.5	0.005	3.264	131403	0.040	0.034	0.035	0.035	0.284	0.217
5.0	0.005	3.626	146003	0.040	0.034	0.034	0.034	0.350	0.268
5.5	0.006	3.989	160603	0.040	0.034	0.034	0.034	0.422	0.324
6.0	0.006	4.351	175204	0.040	0.034	0.034	0.034	0.502	0.386
6.5	0.007	4.714	189804	0.040	0.034	0.034	0.034	0.589	0.453
7.0	0.007	5.077	204404	0.040	0.034	0.034	0.034	0.682	0.525
7.5	0.008	5.439	219005	0.040	0.034	0.034	0.034	0.783	0.603
8.0	0.008	5.802	233605	0.040	0.034	0.034	0.034	0.890	0.686
8.5	0.009	6.165	248205	0.040	0.034	0.034	0.034	1.004	0.775
9.0	0.009	6.527	262806	0.040	0.034	0.034	0.034	1.125	0.869
9.5	0.010	6.890	277406	0.040	0.034	0.034	0.034	1.253	0.968
10.0	0.010	7.252	292006	0.040	0.034	0.034	0.034	1.388	1.072
11.0	0.011	7.978	321207	0.040	0.034	0.034	0.034	1.678	1.298
12.0	0.012	8.703	350407	0.040	0.034	0.034	0.034	1.996	1.544
13.0	0.013	9.428	379608	0.040	0.034	0.034	0.034	2.342	1.812
14.0	0.014	10.153	408809	0.040	0.034	0.034	0.034	2.715	2.102

**Potrubí  
DN100**

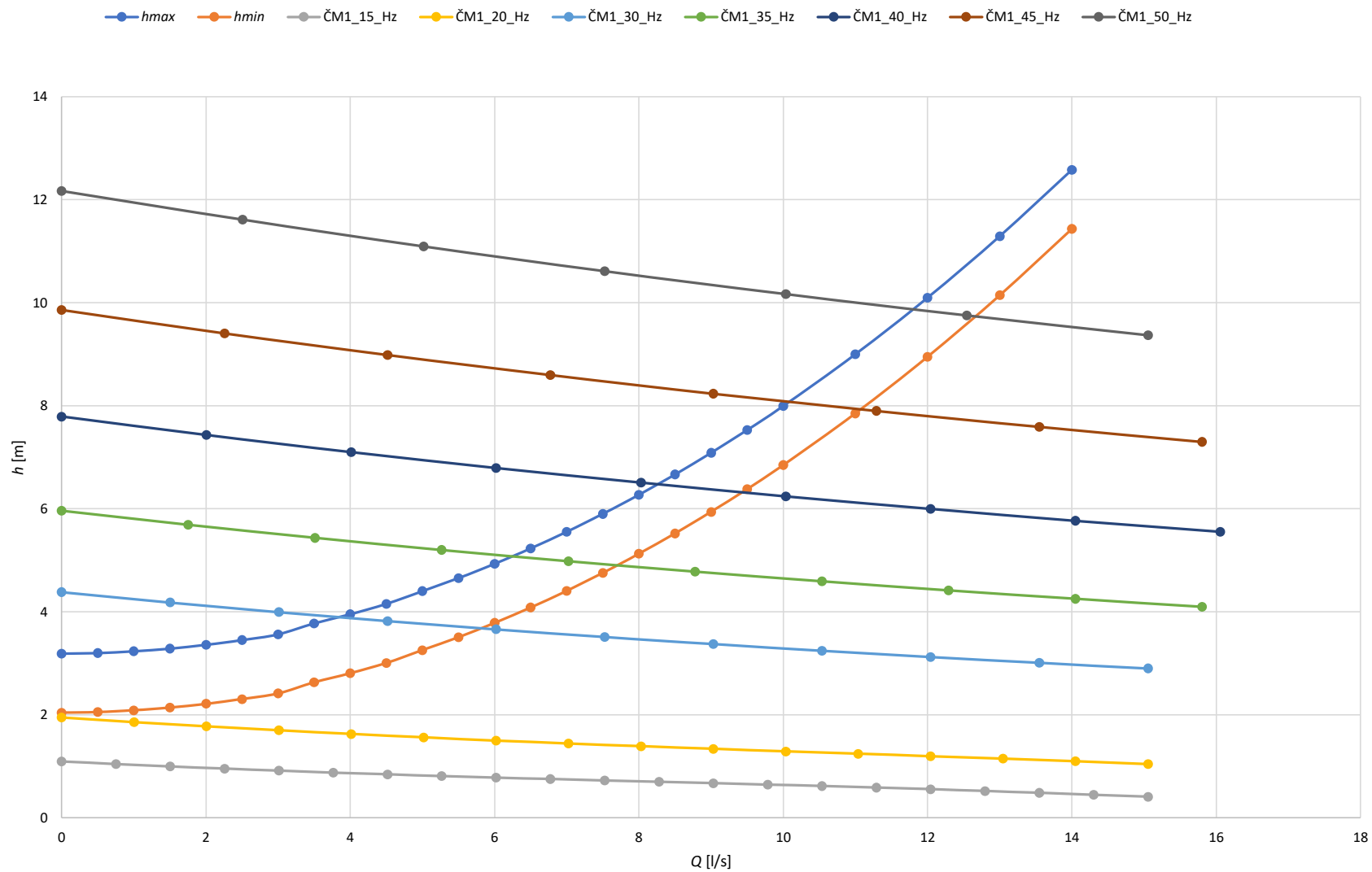
Q	Q	v <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0.000	0
0.5	0.001	0.064	0.000
1.0	0.001	0.127	0.000
1.5	0.002	0.191	0.001
2.0	0.002	0.255	0.001
2.5	0.003	0.318	0.002
3.0	0.003	0.382	0.003
3.5	0.004	0.446	0.003
4.0	0.004	0.509	0.004
4.5	0.005	0.573	0.006
5.0	0.005	0.637	0.007
5.5	0.006	0.700	0.008

Q	Q	V <sub>40</sub>	h <sub>m100</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
6.0	0.006	0.764	0.010
6.5	0.007	0.828	0.012
7.0	0.007	0.891	0.014
7.5	0.008	0.955	0.016
8.0	0.008	1.019	0.018
8.5	0.009	1.082	0.020
9.0	0.009	1.146	0.023
9.5	0.010	1.210	0.025
10.0	0.010	1.273	0.028
11.0	0.011	1.401	0.034
12.0	0.012	1.528	0.040
13.0	0.013	1.655	0.047
14.0	0.014	1.783	0.055

#### Výsledná tabulka

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0.000	0.000	3.188	2.042
0.5	0.0005	0.003	0.009	3.201	2.054
1	0.001	0.012	0.034	3.234	2.087
1.5	0.0015	0.024	0.075	3.287	2.141
2	0.002	0.040	0.132	3.360	2.213
2.5	0.0025	0.058	0.205	3.452	2.305
3	0.003	0.080	0.293	3.562	2.416
3.5	0.0035	0.190	0.398	3.776	2.630
4	0.004	0.247	0.518	3.953	2.807
4.5	0.0045	0.311	0.655	4.154	3.007
5	0.005	0.407	0.807	4.402	3.256
5.5	0.0055	0.492	0.974	4.655	3.508
6	0.006	0.584	1.158	4.931	3.784
6.5	0.0065	0.685	1.357	5.231	4.084
7	0.007	0.794	1.572	5.554	4.408
7.5	0.0075	0.910	1.803	5.902	4.755
8	0.008	1.035	2.050	6.273	5.127
8.5	0.0085	1.168	2.312	6.668	5.522
9	0.009	1.308	2.590	7.087	5.940
9.5	0.0095	1.457	2.884	7.529	6.383
10	0.01	1.614	3.193	7.995	6.849
11	0.011	1.951	3.860	8.999	7.852
12	0.012	2.320	4.589	10.097	8.951
13	0.013	2.723	5.381	11.293	10.146
14	0.014	3.157	6.236	12.581	11.434

Q-h charakteristika potrubí a čerpadel "ČM1-Ž2" - (0 - 14) l/s



## Směr čerpaného množství a použité čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2		X	

### Výpočty:

Rozsah průtoků v připojovacím bodě:

Ž2 - Velké průtoky (0-60) l/s

Čerpadlo - ČM1

Délky:

$L_{DN200}$	9.749	m
$L_{DN150}$	1.901	m

	$\zeta$				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
Zúžení z DN 200 na DN 150				0.200	
Indukční průtokoměr DN 150				0.100	
T kus změna směru 90°					1.040
Nožové šoupátko				0.06	
Rozšíření z DN 150 na DN 200					0.218
Koleno 90°					0.340
Pryžový kompenzátor					0.071
Nožové šoupátko					0.040
Vtok do žlabu					1.000
$\Sigma$	0	0	0.340	1.323	3.966

**Potrubí DN200**

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.002	0.005
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.003	0.012
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.005	0.020
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.007	0.032
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.010	0.046
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.018	0.063
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.024	0.082
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.030	0.104
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.036	0.128
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.044	0.155
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.052	0.184
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.061	0.216
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.070	0.251
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.080	0.288
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.091	0.328
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.103	0.370
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.115	0.415
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.128	0.462
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.141	0.512
52.5	0.053	1.671	321170	0.0400	0.0222	0.0224	0.0224	0.156	0.565
55.0	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.170	0.620
57.5	0.058	1.830	351758	0.0400	0.0222	0.0224	0.0224	0.186	0.677
60.0	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.202	0.737

**Potrubí DN150**

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.011
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.031
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.002	0.057
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.004	0.090
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.008	0.128
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.012	0.170
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.016	0.218
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.020	0.270
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.026	0.327
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.031	0.388
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.038	0.454



Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.045	0.524
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.053	0.597
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.061	0.675
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.070	0.757
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.079	0.843
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.089	0.933
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.100	1.026
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.112	1.124
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.123	1.225
52.5	0.053	2.971	428227	0.0400	0.0238	0.0238	0.0238	0.136	1.330
55.0	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.149	1.439
57.5	0.058	3.254	469011	0.0400	0.0237	0.0238	0.0238	0.163	1.551
60.0	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.177	1.667

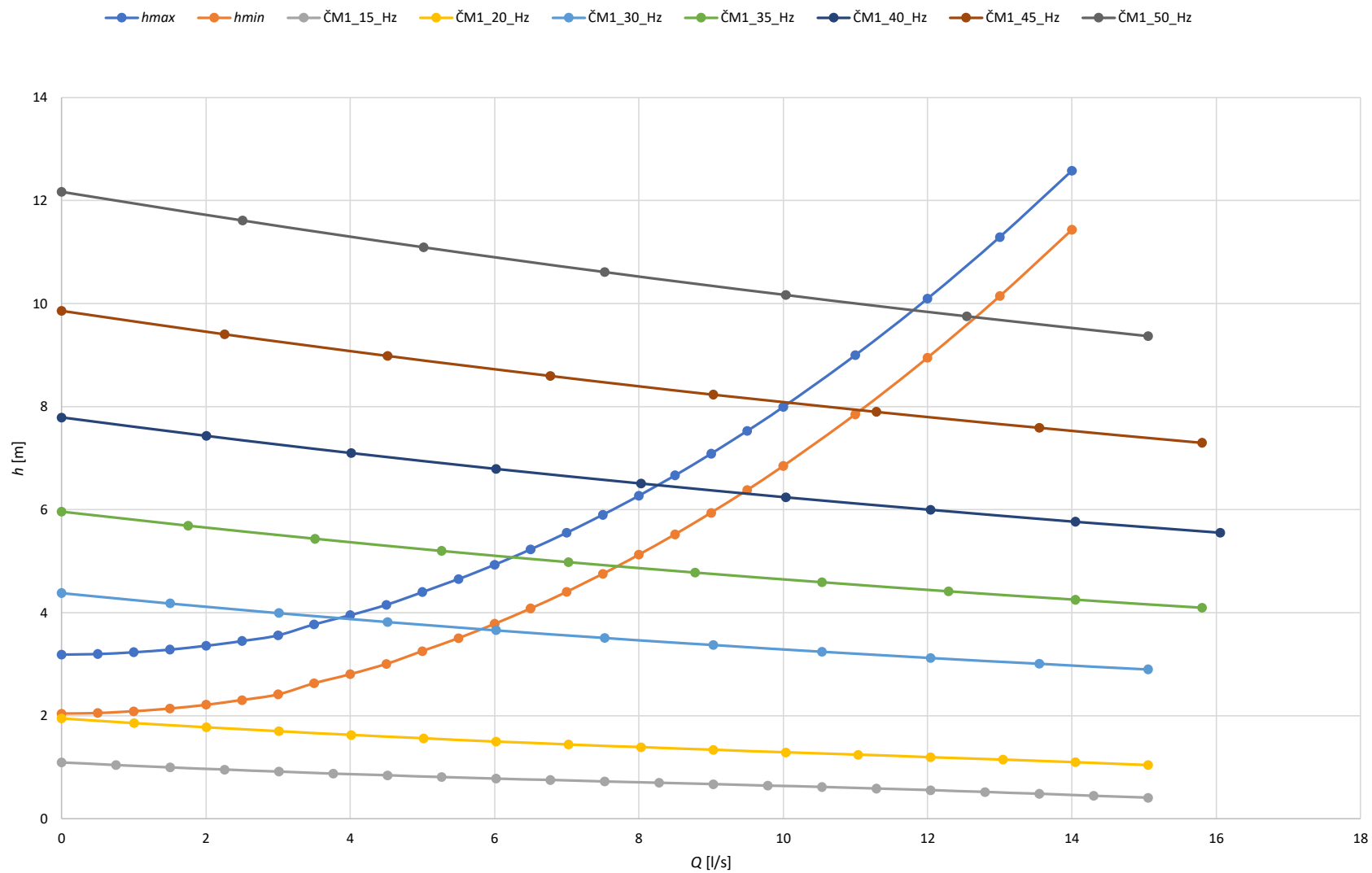
#### Potrubí DN100

Q	Q	v <sub>40</sub>	h <sub>m40</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[m]
0	0	0	0
2.5	0.003	0.318	0.002
5.0	0.005	0.637	0.007
7.5	0.008	0.955	0.016
10.0	0.010	1.273	0.028
12.5	0.013	1.592	0.044
15.0	0.015	1.910	0.063
17.5	0.018	2.228	0.086
20.0	0.020	2.546	0.112
22.5	0.023	2.865	0.142
25.0	0.025	3.183	0.176
27.5	0.028	3.501	0.212
30.0	0.030	3.820	0.253
32.5	0.033	4.138	0.297
35.0	0.035	4.456	0.344
37.5	0.038	4.775	0.395
40.0	0.040	5.093	0.449
42.5	0.043	5.411	0.507
45.0	0.045	5.730	0.569
47.5	0.048	6.048	0.634
50.0	0.050	6.366	0.702
52.5	0.053	6.685	0.774
55.0	0.055	7.003	0.850
57.5	0.058	7.321	0.929
60.0	0.060	7.639	1.011

### Výsledná tabulka

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
0	0	0	0	3.188	2.042
2.5	0.003	0.001	0.014	3.203	2.056
5.0	0.005	0.003	0.043	3.234	2.087
7.5	0.008	0.005	0.085	3.278	2.132
10.0	0.010	0.009	0.138	3.336	2.189
12.5	0.013	0.016	0.203	3.407	2.261
15.0	0.015	0.022	0.280	3.490	2.344
17.5	0.018	0.034	0.367	3.589	2.443
20.0	0.020	0.044	0.465	3.697	2.551
22.5	0.023	0.055	0.573	3.817	2.670
25.0	0.025	0.068	0.692	3.948	2.802
27.5	0.028	0.082	0.821	4.091	2.945
30.0	0.030	0.097	0.961	4.246	3.100
32.5	0.033	0.113	1.110	4.412	3.266
35.0	0.035	0.131	1.270	4.590	3.443
37.5	0.038	0.150	1.440	4.779	3.632
40.0	0.040	0.170	1.620	4.979	3.832
42.5	0.043	0.192	1.810	5.191	4.044
45.0	0.045	0.215	2.010	5.413	4.267
47.5	0.048	0.239	2.220	5.647	4.501
50.0	0.050	0.265	2.439	5.892	4.746
52.5	0.053	0.291	2.669	6.149	5.002
55.0	0.055	0.320	2.908	6.416	5.269
57.5	0.058	0.349	3.157	6.694	5.548
60.0	0.060	0.380	3.416	6.984	5.837

Q-h charakteristika potrubí a čerpadel "ČM1-Ž2" - (0 - 14) l/s



## Směr čerpaného množství a použitá čerpadla

Čerpadlo	ČM1	ČM1	ČM1+ČM2
Připojovací bod	(0-14) l/s	(0-60) l/s	(0-100) l/s
R1			
R2			
R3			
R4			
R5			
R6			
Měrný žlab Ž1			
Měrný žlab Ž2			

**Ž2 - Velké průtoky (0-100) l/s**

**Čerpadlo - ČM1+ČM2**

ČM1	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus změna směru 90°					1.040
T kus (M1+M2) směr od M1					0.430
Σ	0	0	0.340	0.963	1.688

ČM2	ζ				
Singularity	DN40	DN50	DN100	DN150	DN200
Koleno 90°			0.340		
Rozšíření z DN 100 na DN 150				0.563	
Koleno 90°				0.340	
Nožové šoupátko				0.060	
Rozšíření z DN 150 na DN 200					0.218
T kus (M1+M2) směr od M2					0.460
Σ	0	0	0.340	0.963	0.678

ČM1+ČM2	ζ							
Singularity	DN40	DN50	DN100	DN150	DN200			
Zúžení z DN 200 na DN 150				0.200				
Indukční průtokoměr DN 150				0.100				
Nožové šoupátko				0.06				
Rozšíření z DN 150 na DN 200					0.218			
T kus změna směru 90°					1.040			
Koleno 90°					0.340			
Nožové šoupátko					0.040			
Pryžový kompenzázor					0.071			
Vtok do žlabu					1.000			
Σ	0	0	0	0.360	2.708			
DÉLKY ČM1			DÉLKY ČM2			DÉLKY ČM1+ČM2		
L <sub>DN200</sub>	0.244 m		L <sub>DN200</sub>			L <sub>DN200</sub>	8.761	m
L <sub>DN150</sub>	0.699 m		L <sub>DN150</sub>	0.699 m		L <sub>DN150</sub>	1.202	m

### Potrubí DN200

ČM1									
Q	Q	$v_{200}$	$Re_{200}$	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{200}$	$h_{t200}$	$h_{m200}$
[l/s]	[m³/s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.001
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.002
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.005
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.000	0.009
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.000	0.014
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.000	0.020
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.000	0.027
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.001	0.035
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.001	0.044
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.001	0.054
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.001	0.066
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.001	0.078
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.002	0.092
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.002	0.107
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.002	0.123
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.002	0.139
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.003	0.157
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.003	0.176
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.003	0.197
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.004	0.218

ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
2.5	0.003	0.080	15294	0.0400	0.0285	0.0285	0.0285	0.000	0.000
5.0	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.000	0.001
7.5	0.008	0.239	45881	0.0400	0.0216	0.0216	0.0216	0.000	0.002
10.0	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.000	0.004
12.5	0.013	0.398	76469	0.0400	0.0190	0.0190	0.0190	0.000	0.005
15.0	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.000	0.008
17.5	0.018	0.557	107057	0.0400	0.0232	0.0236	0.0236	0.000	0.011
20.0	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.000	0.014
22.5	0.023	0.716	137644	0.0400	0.0229	0.0233	0.0232	0.000	0.018
25.0	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.000	0.022
27.5	0.028	0.875	168232	0.0400	0.0227	0.0230	0.0230	0.000	0.026
30.0	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.000	0.032
32.5	0.033	1.035	198820	0.0400	0.0226	0.0228	0.0228	0.000	0.037
35.0	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.000	0.043
37.5	0.038	1.194	229407	0.0400	0.0224	0.0227	0.0227	0.000	0.049
40.0	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.000	0.056
42.5	0.043	1.353	259995	0.0400	0.0224	0.0226	0.0226	0.000	0.063
45.0	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.000	0.071
47.5	0.048	1.512	290583	0.0400	0.0223	0.0225	0.0225	0.000	0.079
50.0	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.000	0.088
ČM1+ČM2									
Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0	0
5	0.005	0.159	30588	0.0400	0.0239	0.0239	0.0239	0.001	0.003
10	0.010	0.318	61175	0.0400	0.0201	0.0201	0.0201	0.005	0.014
15	0.015	0.477	91763	0.0400	0.0182	0.0182	0.0182	0.009	0.031
20	0.020	0.637	122351	0.0400	0.0230	0.0234	0.0234	0.021	0.056
25	0.025	0.796	152938	0.0400	0.0228	0.0231	0.0231	0.033	0.087
30	0.030	0.955	183526	0.0400	0.0226	0.0229	0.0229	0.047	0.126
35	0.035	1.114	214113	0.0400	0.0225	0.0227	0.0227	0.063	0.171
40	0.040	1.273	244701	0.0400	0.0224	0.0226	0.0226	0.082	0.224
45	0.045	1.432	275289	0.0400	0.0223	0.0225	0.0225	0.103	0.283
50	0.050	1.592	305876	0.0400	0.0223	0.0225	0.0224	0.127	0.350
55	0.055	1.751	336464	0.0400	0.0222	0.0224	0.0224	0.153	0.423
60	0.060	1.910	367052	0.0400	0.0222	0.0223	0.0223	0.182	0.504
65	0.065	2.069	397639	0.0400	0.0222	0.0223	0.0223	0.213	0.591
70	0.070	2.228	428227	0.0400	0.0221	0.0223	0.0223	0.247	0.685
75	0.075	2.387	458815	0.0400	0.0221	0.0222	0.0222	0.283	0.787

Q	Q	v <sub>200</sub>	Re <sub>200</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>200</sub>	h <sub>t200</sub>	h <sub>m200</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
80	0.080	2.546	489402	0.0400	0.0221	0.0222	0.0222	0.321	0.895
85	0.085	2.706	519990	0.0400	0.0221	0.0222	0.0222	0.362	1.011
90	0.090	2.865	550578	0.0400	0.0220	0.0221	0.0221	0.406	1.133
95	0.095	3.024	581165	0.0400	0.0220	0.0221	0.0221	0.452	1.262
100	0.100	3.183	611753	0.0400	0.0220	0.0221	0.0221	0.500	1.399

#### Potrubí DN150

##### ČM1

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.010
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.000	0.029
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.054
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.001	0.084
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.003	0.118
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.004	0.157
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.006	0.200
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.007	0.247
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.009	0.297
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.012	0.352
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.014	0.409
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.017	0.471
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.019	0.535
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.022	0.603
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.026	0.674
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.029	0.749
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.033	0.826
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.037	0.907
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.041	0.991
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.045	1.078

##### ČM2

Q	Q	v <sub>150</sub>	Re <sub>150</sub>	λ <sub>1</sub>	λ <sub>2</sub>	λ <sub>3</sub>	λ <sub>150</sub>	h <sub>t150</sub>	h <sub>m150</sub>
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
2.5	0.003	0.141	20392	0.0400	0.0265	0.0265	0.0265	0.000	0.010
5.0	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.000	0.029
7.5	0.008	0.424	61175	0.0400	0.0201	0.0201	0.0201	0.001	0.054
10.0	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.001	0.084
12.5	0.013	0.707	101959	0.0400	0.0248	0.0251	0.0251	0.003	0.118
15.0	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.004	0.157
17.5	0.018	0.990	142742	0.0400	0.0244	0.0246	0.0246	0.006	0.200

Q	Q	v150	Re150	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
20.0	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.007	0.247
22.5	0.023	1.273	183526	0.0400	0.0242	0.0244	0.0244	0.009	0.297
25.0	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.012	0.352
27.5	0.028	1.556	224309	0.0400	0.0240	0.0242	0.0242	0.014	0.409
30.0	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.017	0.471
32.5	0.033	1.839	265093	0.0400	0.0240	0.0241	0.0241	0.019	0.535
35.0	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.022	0.603
37.5	0.038	2.122	305876	0.0400	0.0239	0.0240	0.0240	0.026	0.674
40.0	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.029	0.749
42.5	0.043	2.405	346660	0.0400	0.0238	0.0239	0.0239	0.033	0.826
45.0	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.037	0.907
47.5	0.048	2.688	387443	0.0400	0.0238	0.0239	0.0239	0.041	0.991
50.0	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.045	1.078
<b>ČM1+ČM2</b>									
Q	Q	v150	Re150	$\lambda_1$	$\lambda_2$	$\lambda_3$	$\lambda_{150}$	$h_{t150}$	$h_{m150}$
[l/s]	[m <sup>3</sup> /s]	[m/s]	[-]	[-]	[-]	[-]	[-]	[m]	[m]
0	0	0	0	0	0	0	0	0.000	0.000
5	0.005	0.283	40784	0.0400	0.0223	0.0223	0.0223	0.001	0.001
10	0.010	0.566	81567	0.0400	0.0187	0.0187	0.0187	0.002	0.006
15	0.015	0.849	122351	0.0400	0.0245	0.0248	0.0248	0.007	0.013
20	0.020	1.132	163134	0.0400	0.0243	0.0245	0.0245	0.013	0.024
25	0.025	1.415	203918	0.0400	0.0241	0.0243	0.0243	0.020	0.037
30	0.030	1.698	244701	0.0400	0.0240	0.0242	0.0242	0.028	0.053
35	0.035	1.981	285485	0.0400	0.0239	0.0241	0.0241	0.039	0.072
40	0.040	2.264	326268	0.0400	0.0239	0.0240	0.0240	0.050	0.094
45	0.045	2.546	367052	0.0400	0.0238	0.0239	0.0239	0.063	0.119
50	0.050	2.829	407835	0.0400	0.0238	0.0239	0.0239	0.078	0.147
55	0.055	3.112	448619	0.0400	0.0237	0.0238	0.0238	0.094	0.178
60	0.060	3.395	489402	0.0400	0.0237	0.0238	0.0238	0.112	0.212
65	0.065	3.678	530186	0.0400	0.0237	0.0238	0.0238	0.131	0.248
70	0.070	3.961	570969	0.0400	0.0237	0.0237	0.0237	0.152	0.288
75	0.075	4.244	611753	0.0400	0.0237	0.0237	0.0237	0.175	0.331
80	0.080	4.527	652536	0.0400	0.0236	0.0237	0.0237	0.198	0.376
85	0.085	4.810	693320	0.0400	0.0236	0.0237	0.0237	0.224	0.425
90	0.090	5.093	734103	0.0400	0.0236	0.0237	0.0237	0.251	0.476
95	0.095	5.376	774887	0.0400	0.0236	0.0237	0.0237	0.279	0.530
100	0.100	5.659	815670	0.0400	0.0236	0.0236	0.0236	0.309	0.588



**Potrubí DN100**

ČM1				ČM2			
Q	Q	v <sub>100</sub>	h <sub>m100</sub>	Q	Q	v <sub>100</sub>	h <sub>m100</sub>
[l/s]	[m³/s]	[m/s]	[m]	[l/s]	[m³/s]	[m/s]	[m]
0	0	0	0.000	0	0	0	0
2.5	0.003	0.318	0.002	2.5	0.003	0.318	0.00176
5.0	0.005	0.637	0.007	5.0	0.005	0.637	0.00702
7.5	0.008	0.955	0.016	7.5	0.008	0.955	0.0158
10.0	0.010	1.273	0.028	10.0	0.010	1.273	0.02809
12.5	0.013	1.592	0.044	12.5	0.013	1.592	0.0439
15.0	0.015	1.910	0.063	15.0	0.015	1.910	0.06321
17.5	0.018	2.228	0.086	17.5	0.018	2.228	0.08604
20.0	0.020	2.546	0.112	20.0	0.020	2.546	0.11237
22.5	0.023	2.865	0.142	22.5	0.023	2.865	0.14222
25.0	0.025	3.183	0.176	25.0	0.025	3.183	0.17558
27.5	0.028	3.501	0.212	27.5	0.028	3.501	0.21245
30.0	0.030	3.820	0.253	30.0	0.030	3.820	0.25284
32.5	0.033	4.138	0.297	32.5	0.033	4.138	0.29673
35.0	0.035	4.456	0.344	35.0	0.035	4.456	0.34414
37.5	0.038	4.775	0.395	37.5	0.038	4.775	0.39506
40.0	0.040	5.093	0.449	40.0	0.040	5.093	0.44949
42.5	0.043	5.411	0.507	42.5	0.043	5.411	0.50743
45.0	0.045	5.730	0.569	45.0	0.045	5.730	0.56889
47.5	0.048	6.048	0.6339	47.5	0.048	6.048	0.63385
50.0	0.050	6.366	0.7023	50.0	0.050	6.366	0.70233

**Výsledná tabulka**

Q	Q	Σh <sub>t</sub>	Σh <sub>m</sub>	h <sub>max</sub>	h <sub>min</sub>
[l/s]	[m³/s]	[m]	[m]	[m]	[m]
0	0	0	0	3.188	2.042
5	0.005	0.002	0.018	3.208	2.062
10	0.010	0.007	0.058	3.254	2.108
15	0.015	0.017	0.119	3.325	2.179
20	0.020	0.036	0.200	3.424	2.278
25	0.025	0.056	0.300	3.544	2.398
30	0.030	0.080	0.419	3.687	2.540
35	0.035	0.108	0.556	3.852	2.706
40	0.040	0.140	0.712	4.040	2.894
45	0.045	0.177	0.886	4.251	3.105
50	0.050	0.217	1.078	4.484	3.338
55	0.055	0.262	1.289	4.740	3.593
60	0.060	0.312	1.517	5.017	3.871
65	0.065	0.365	1.763	5.317	4.170
70	0.070	0.423	2.027	5.639	4.492
75	0.075	0.485	2.309	5.983	4.836

Q	Q	$\Sigma h_t$	$\Sigma h_m$	$h_{\max}$	$h_{\min}$
[l/s]	[m <sup>3</sup> /s]	[m]	[m]	[m]	[m]
80	0.080	0.551	2.609	6.349	5.202
85	0.085	0.622	2.926	6.736	5.590
90	0.090	0.696	3.261	7.146	6.000
95	0.095	0.775	3.614	7.578	6.431
100	0.100	0.858	3.984	8.031	6.885

Q-h charakteristika potrubí a čerpadel "ČM1+ČM2-Ž2" - (0 - 100) l/s

