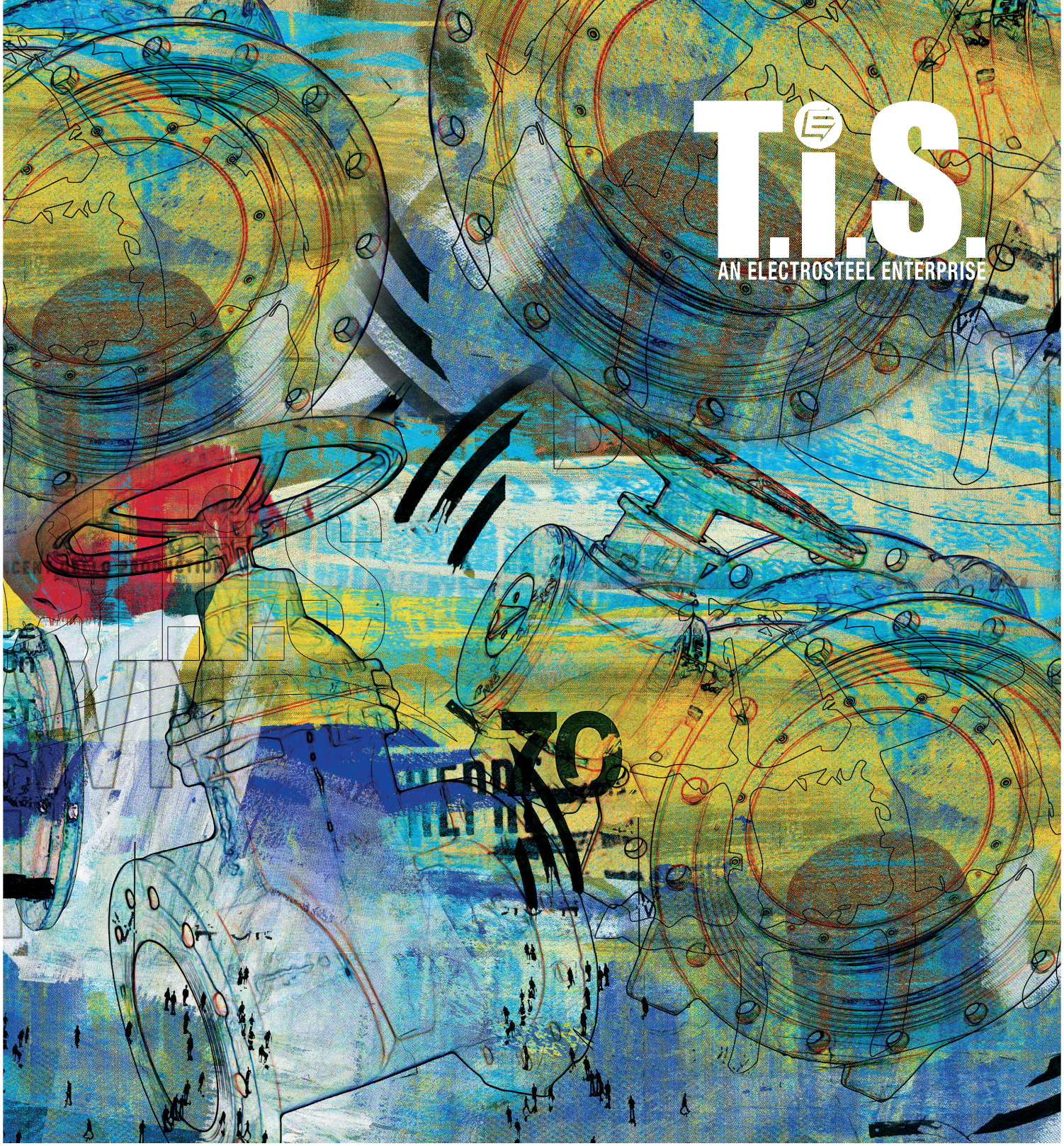
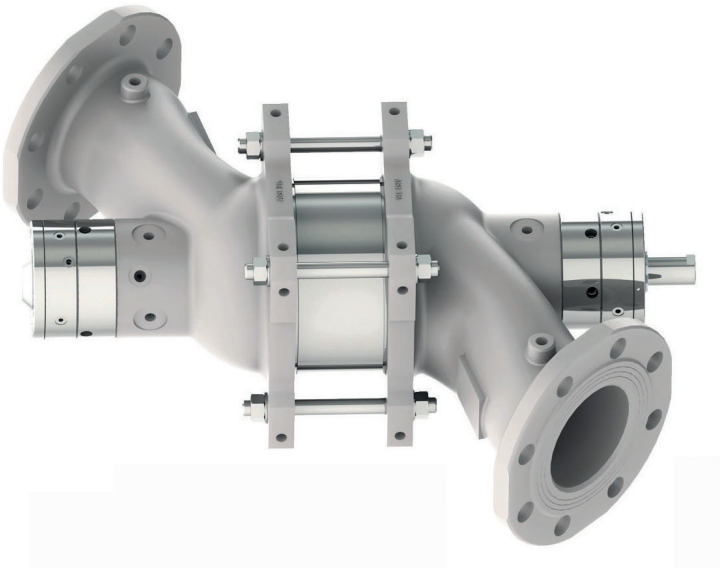


PRESSURE REDUCING STATION WITH ELECTRICITY PRODUCTION

TN • ENERGY PRODUCTION GROUPS



The TN energy production groups are the heart of the “FR pressure reduction station with simultaneous production of electricity” by T.I.S. Service S.p.A. and are designed to recover the energy currently lost at the pressure reduction points of aqueducts and irrigation systems.

They are hydraulic production groups, of the axial type with fixed blades, very simple and robust. The flow modulation towards the user, where necessary, is achieved with a special T.I.S. valve, installed immediately downstream of the group. A second regulation valve, installed in parallel to the production group, guarantees the continuity of the flow towards the user downstream.

The particular construction shape, with aligned flanges, allows direct insertion into existing piping sections. It is also possible to rotate the two inlet/outlet sections to obtain various installation configurations by adding simple 45° bends.

The TN production groups have been designed in various standard models, distinguished by flange diameter, from DN50 to DN350, to cover a very wide range of water flow rates with high efficiency and ensure rapid availability of spare parts.

The body of the TN groups can withstand pressures up to PN40, up to the TN200 model. The larger models are normally made PN16 or 25. The TN groups can work with a head (difference between the inlet and outlet pressure) of up to 80 wmc.

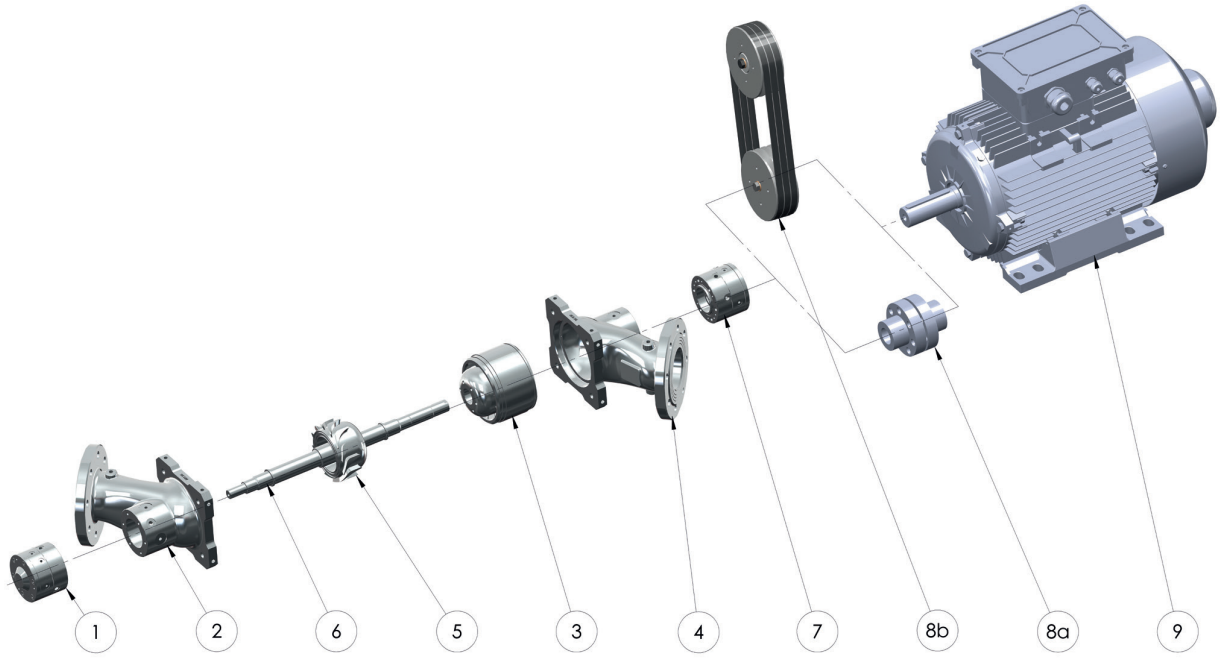
Further peculiar characteristics of the TN groups are the good and stable efficiency, the absolute absence of overpressure phenomena, very low noise level and vibrations.

FR LINE

MATERIALS

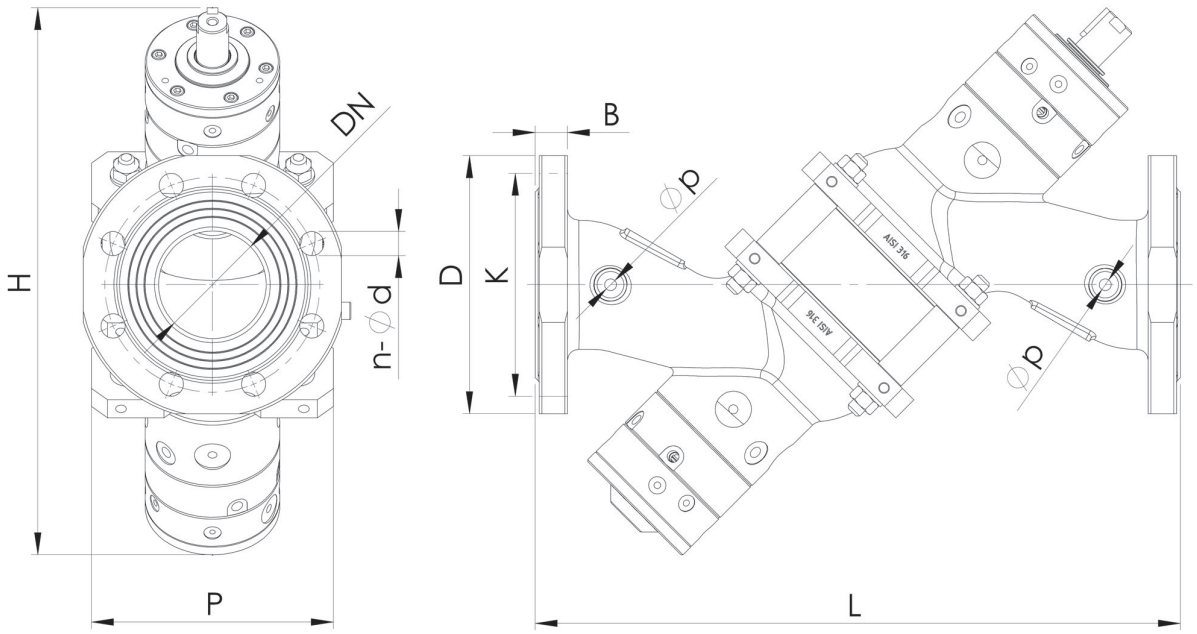
In designing the units, particular attention was paid to the choice of materials in contact with drinking water: following migration tests carried out in the laboratory, the materials used are compliant with the Italian Ministerial Decree 174/2004 and can therefore be used in fixed systems for the collection, treatment, supply and distribution of water intended for human consumption.

In the TN unit, the flow of water that passes through the inlet section (4) is directed by the fixed distributor (3) towards the blades of the impeller (5) and then to the outlet section (2). The unit axis (6) passes through two sliding type mechanical seals and is supported by two bearings at the ends (1-7). The coupling of the shaft line with the generator (9) can be of the belt/pulley type, or direct by means of an elastic joint (8) protected by a special protective casing.



ITEM	COMPONENT	MATERIAL	NOTE
1	Mechanical sealing + bearing support N.D.E.	AISI316 stainless steel	Grease lubricated ball bearing
2	Output elbow	AISI316 stainless steel or FBE coated ductile iron	
3	Distributor	1.4313 martensitic stainless steel	
4	Input elbow	AISI316 stainless steel or FBE coated ductile iron	
5	Runner	1.4313 martensitic stainless steel	
6	Runner shaft	AISI420 martensitic stainless steel	
7	Mechanical sealing + bearing support D.E.	AISI316 stainless steel	Grease lubricated roller bearing
8a	Elastic joint	According to supplier specification	
8b	Belt pulley transmission	According to supplier specification	
9	Generator	According to supplier specification	Asynchronous

DIMENSIONS AND WEIGHTS

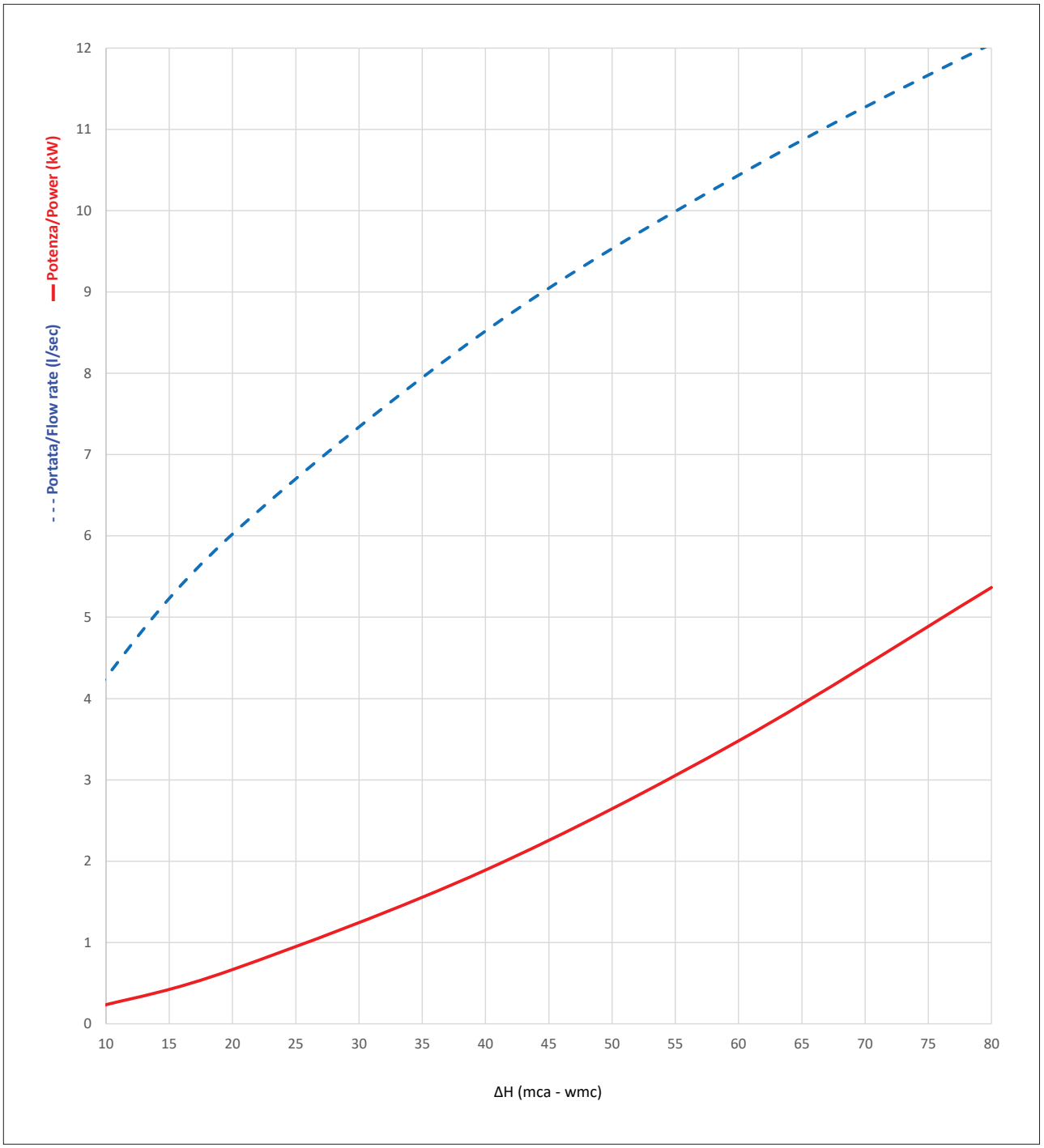


		PN40									PN16/25		
TN		50	65	80	90	100	125	150	180	200	250	300	350
DN	U.M.	50	65	80	100	100	125	150	200	200	250	300	350
D	mm	165	185	200	235	235	270	300	375	375	405	460	520
B	mm	20	22	24	24	24	26	28	34	34	26	28	30
K	mm	125	145	160	190	190	220	250	320	320	355	410	470
n	nr	4	8	8	8	8	8	8	12	12	12	12	16
Ød	m	18	18	18	22	22	26	26	30	30	26	26	26
L	mm	550	560	480	550	600	750	900	1100	1200	1500*	1800*	2100*
P	mm	173	176	180	203	225	282	338	405	450	563*	675*	788*
H	mm	380	400	420	450	480	565	670	760	820	980*	1100*	1250*
W	Kg	40	45	50	70	80	135	220	365	470	900*	1500*	2200*
Øp		G1/8"	G1/8"	G1/4"	G1/4"	G1/4"	G1/4"	G3/8"	G3/8"	G3/8"	G3/8"	G3/8"	G3/8"

FR LINE

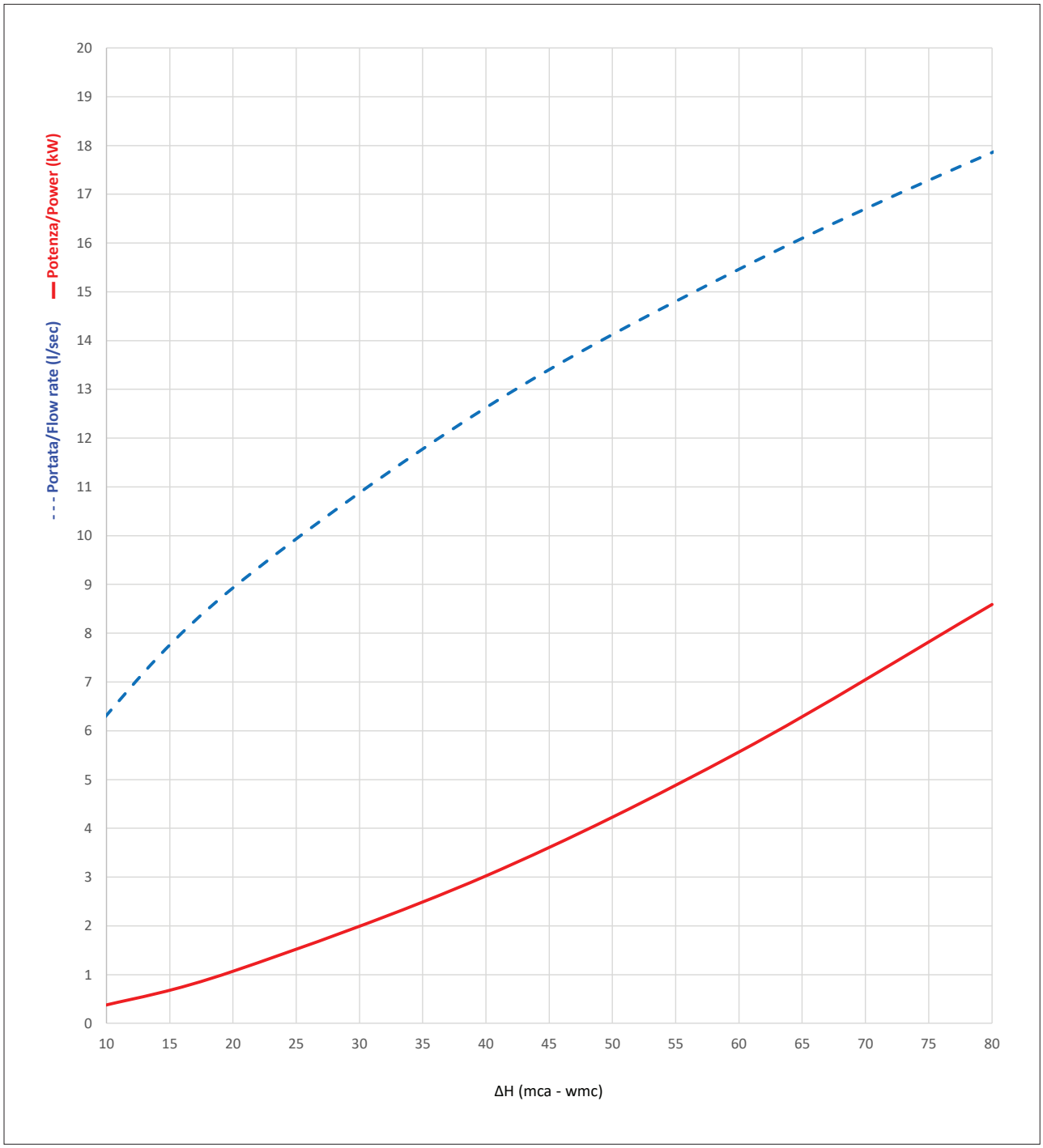
TN50 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER



TN65 GROUP WORKING POINT AND PERFORMANCE CHART

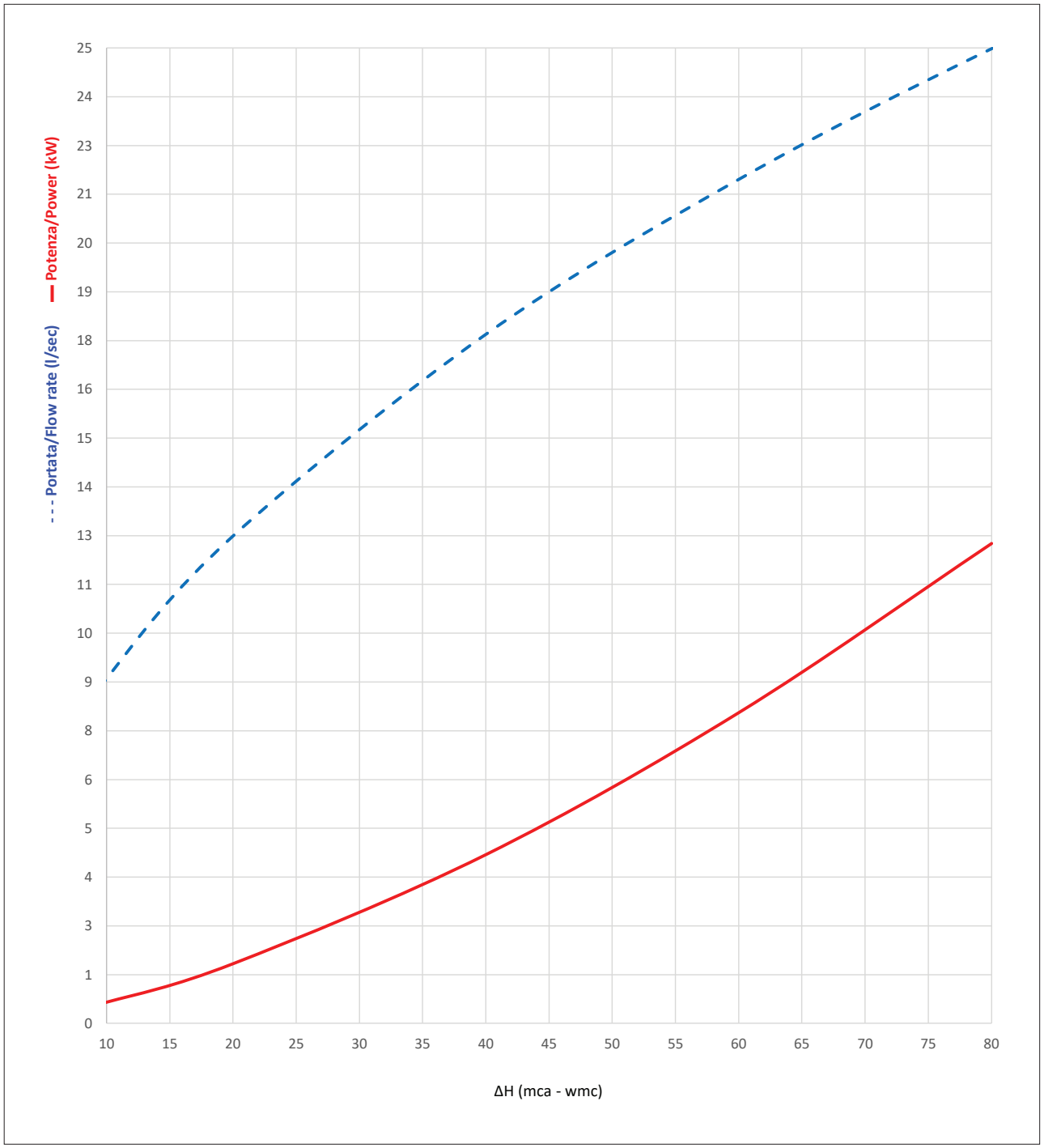
DELTA H vs. FLOW & DELTA H vs. POWER



FR LINE

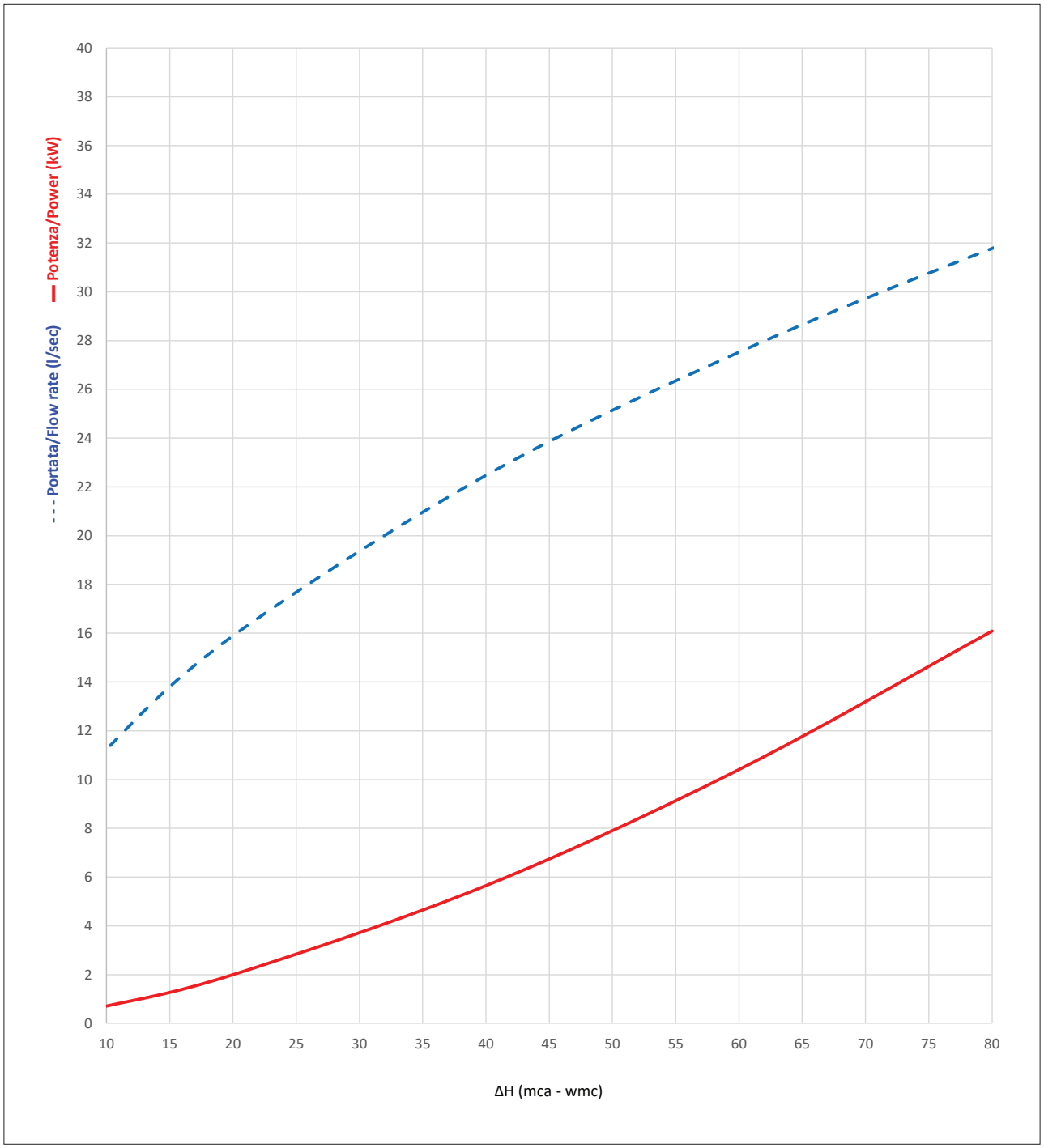
TN80 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER



TN90 GROUP WORKING POINT AND PERFORMANCE CHART

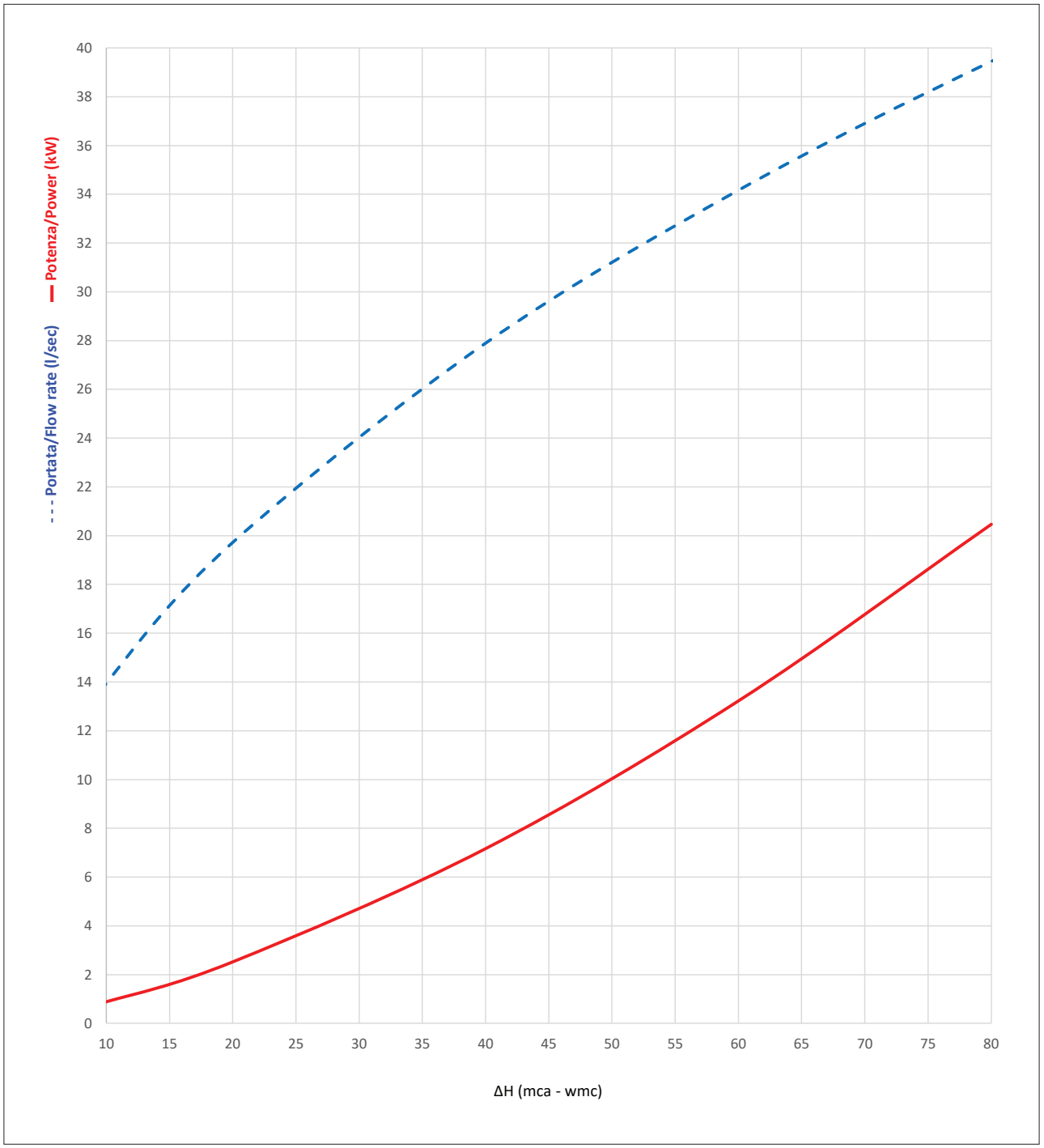
DELTA H vs. FLOW & DELTA H vs. POWER



FR LINE

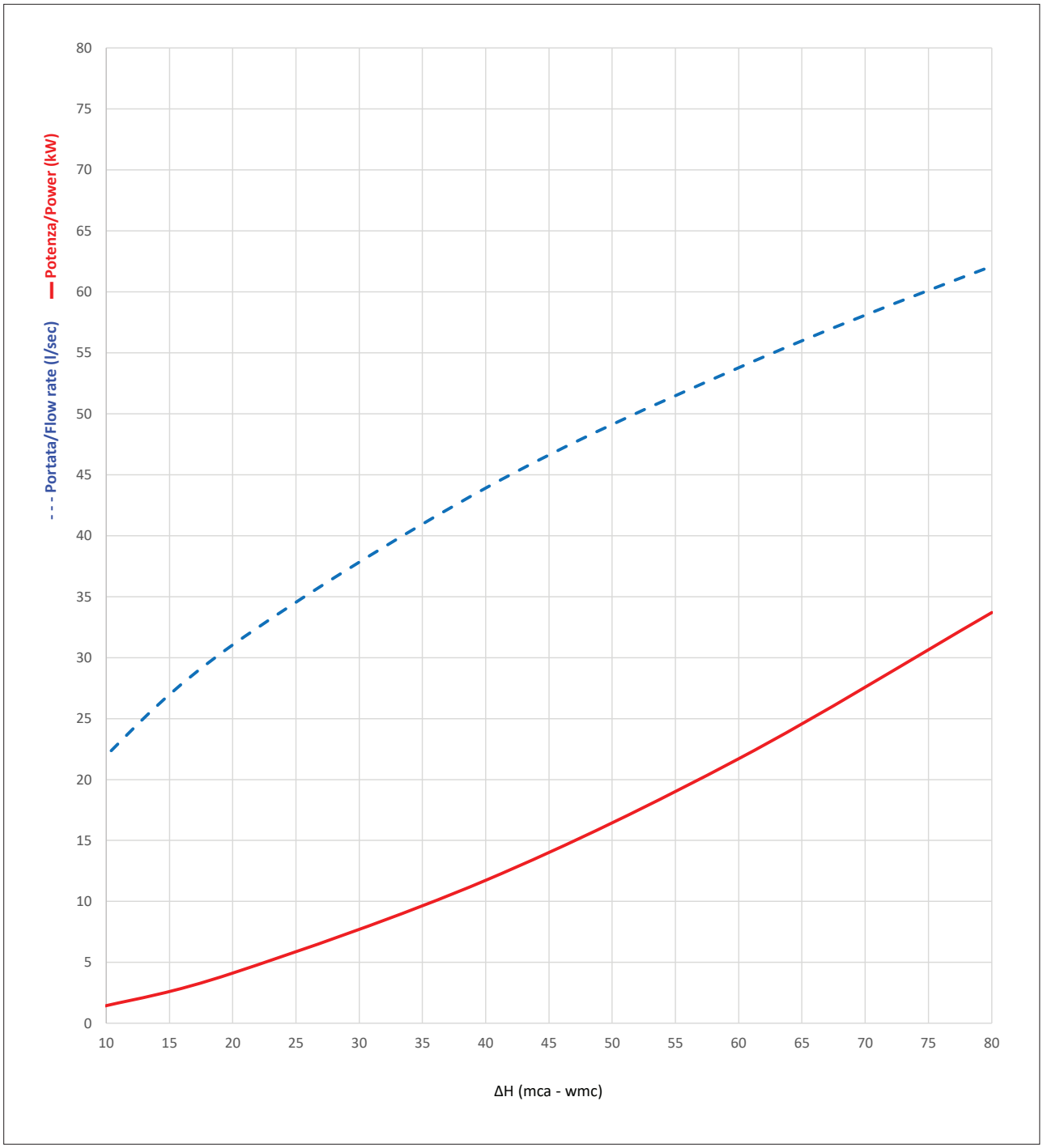
TN100 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER



TN125 GROUP WORKING POINT AND PERFORMANCE CHART

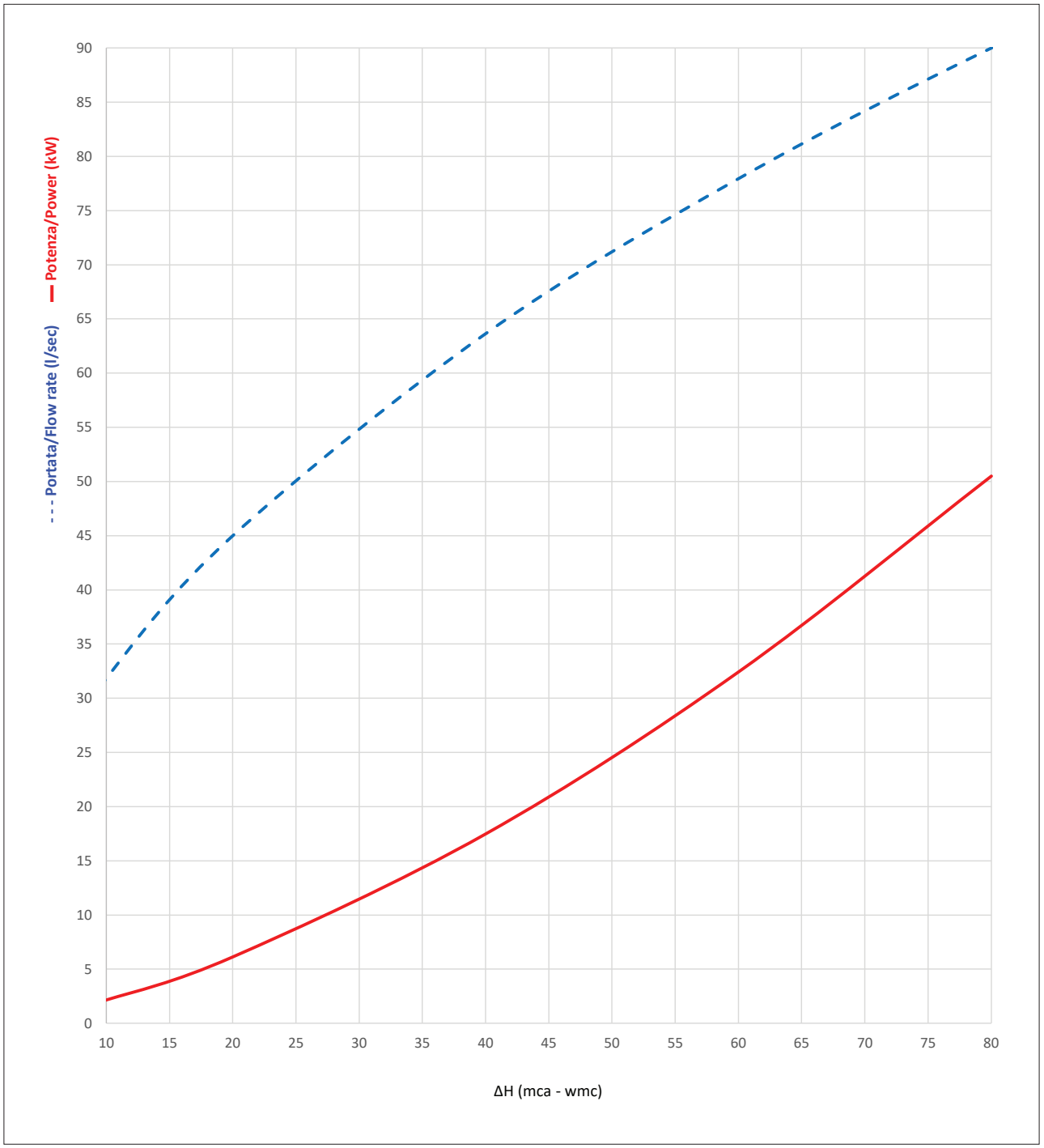
DELTA H vs. FLOW & DELTA H vs. POWER



FR LINE

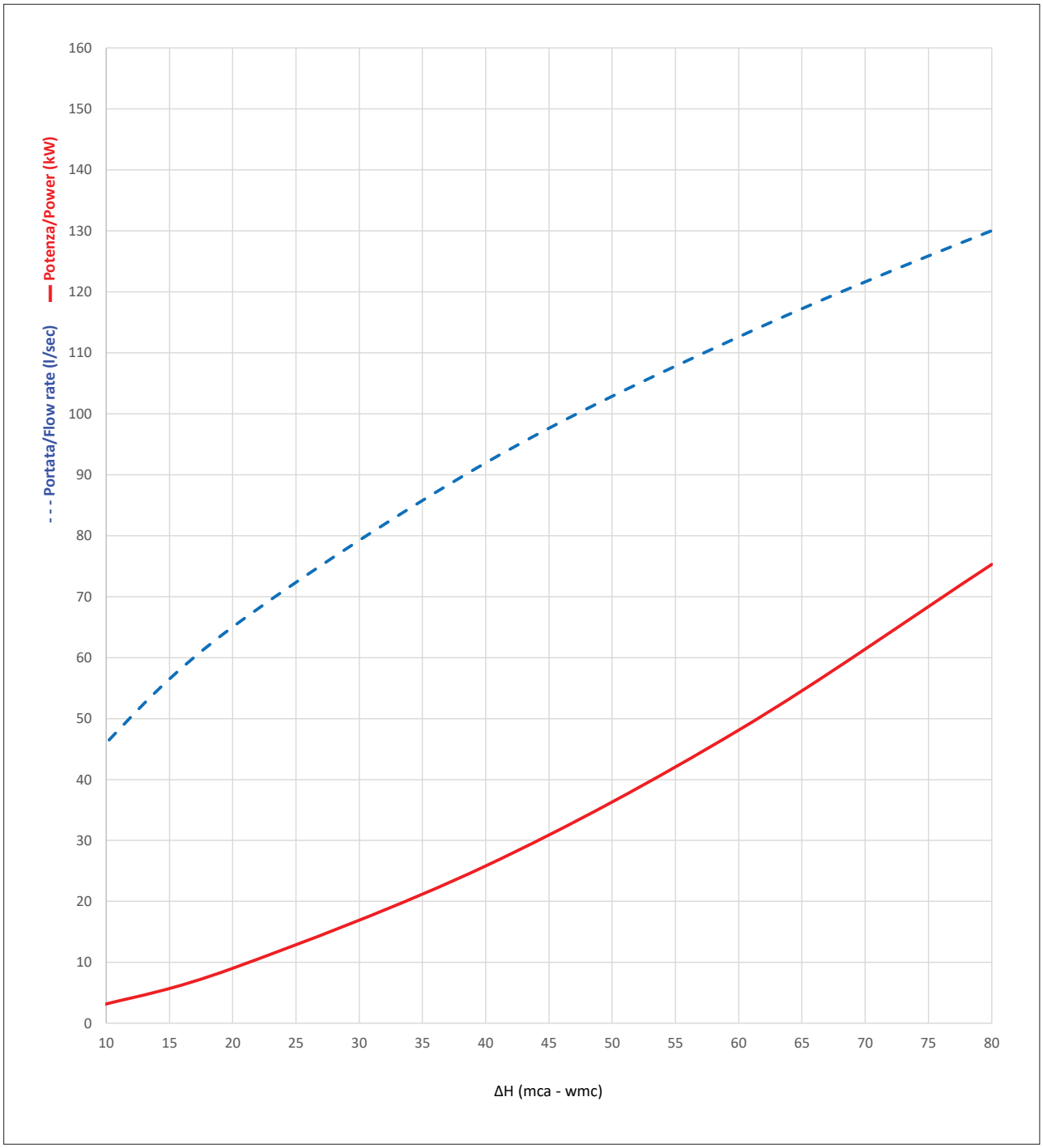
TN150 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER



TN180 GROUP WORKING POINT AND PERFORMANCE CHART

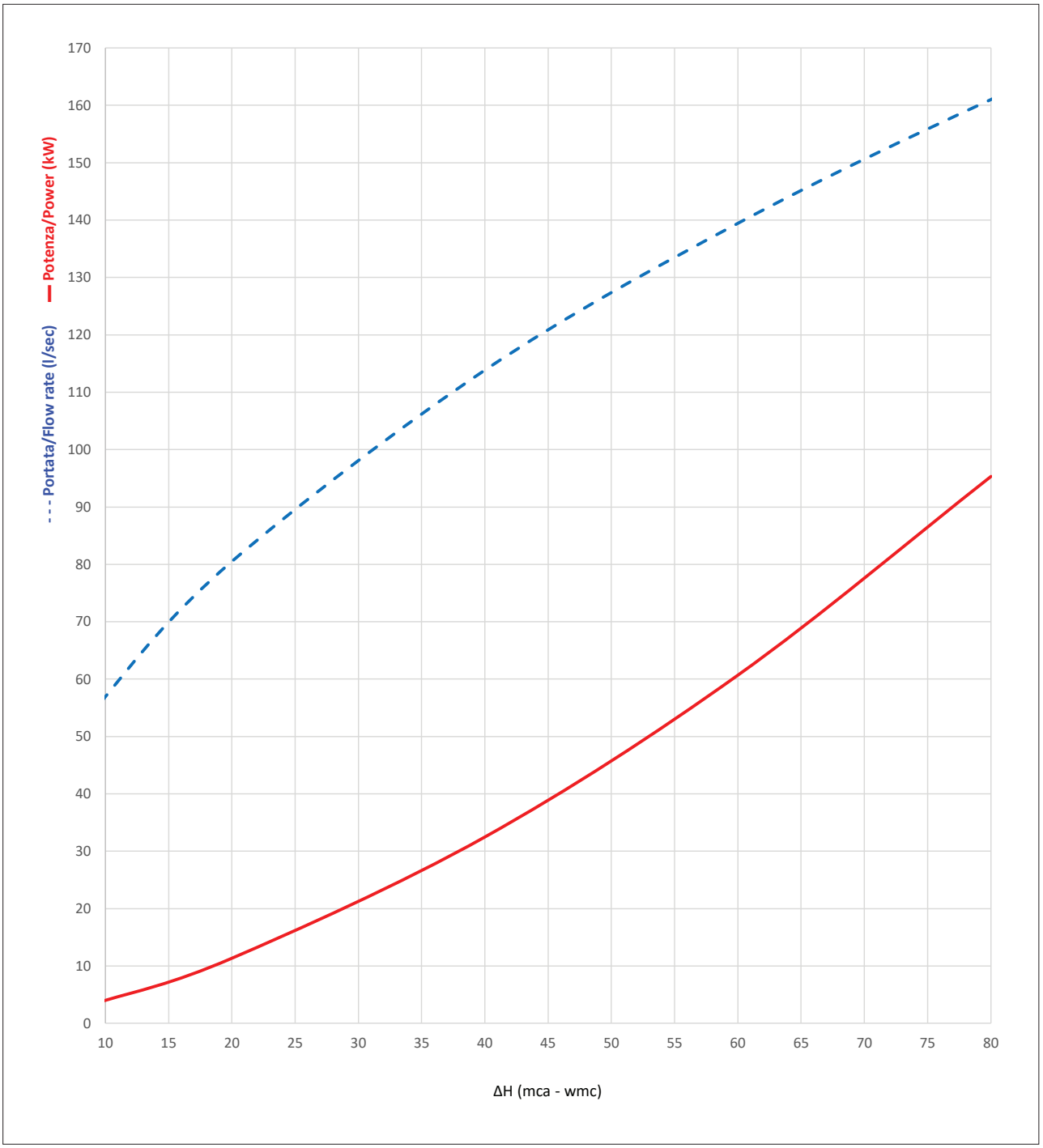
DELTA H vs. FLOW & DELTA H vs. POWER



FR LINE

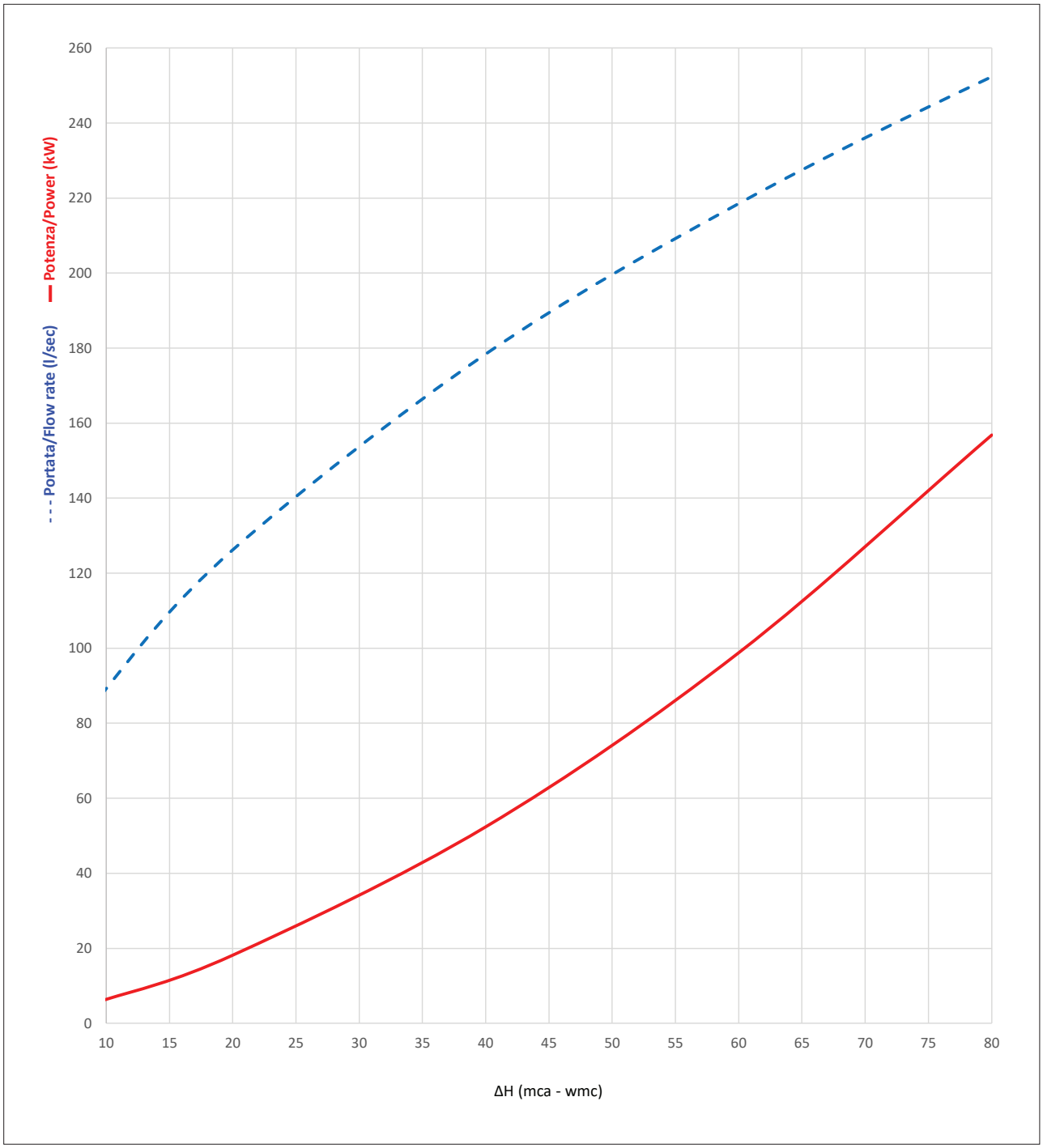
TN200 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER



TN250 GROUP WORKING POINT AND PERFORMANCE CHART

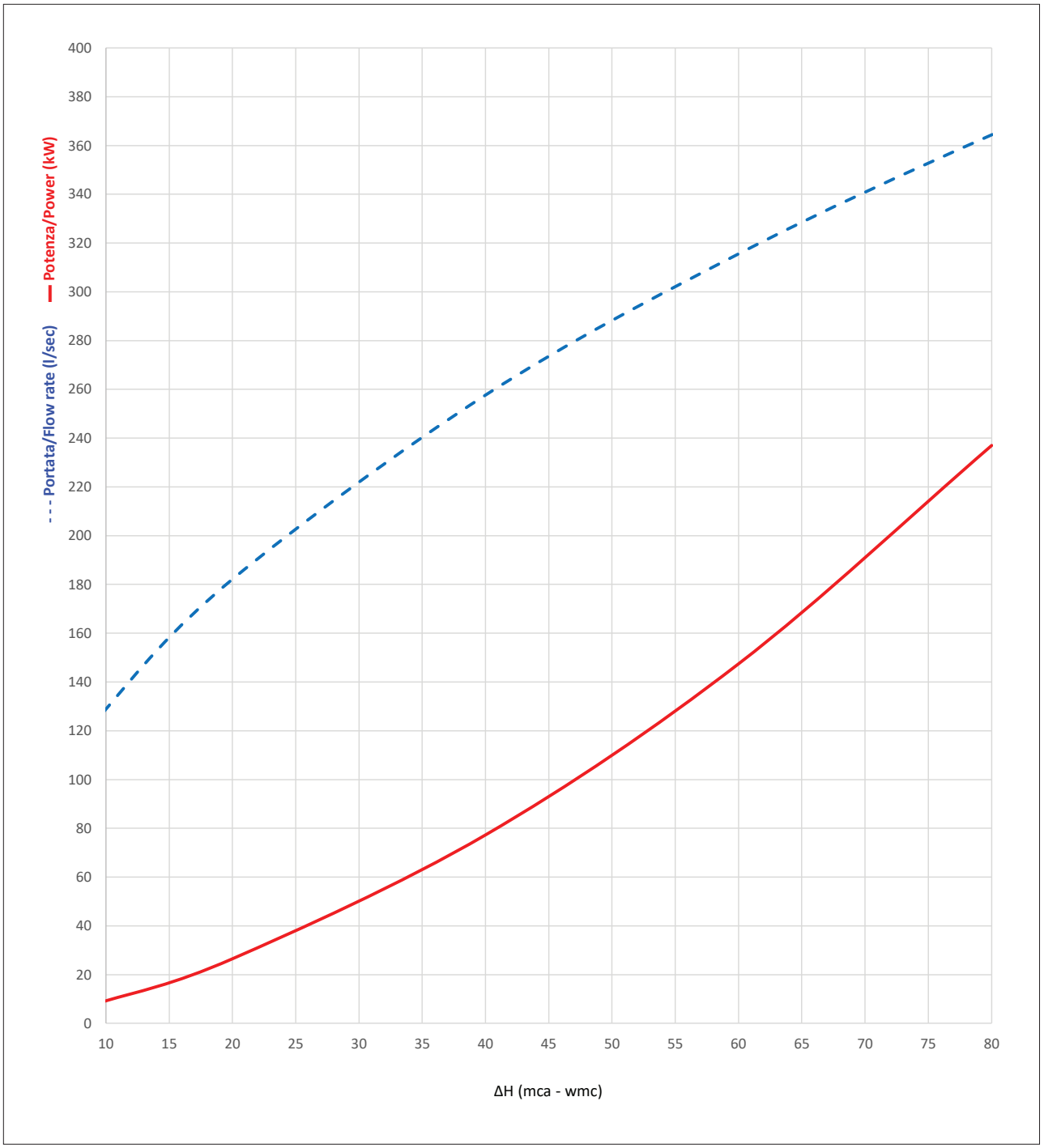
DELTA H vs. FLOW & DELTA H vs. POWER



FR LINE

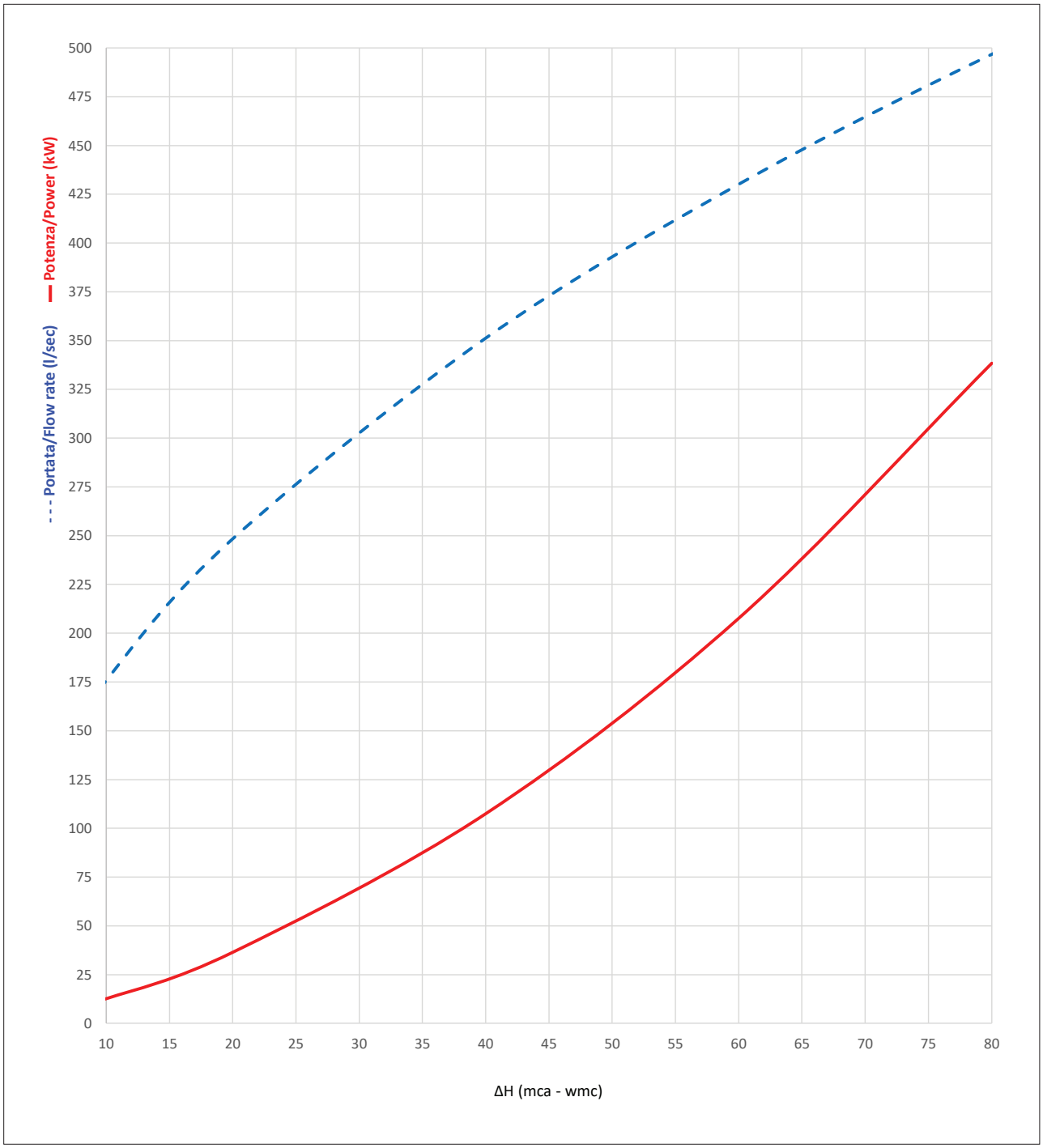
TN300 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER



TN350 GROUP WORKING POINT AND PERFORMANCE CHART

DELTA H vs. FLOW & DELTA H vs. POWER

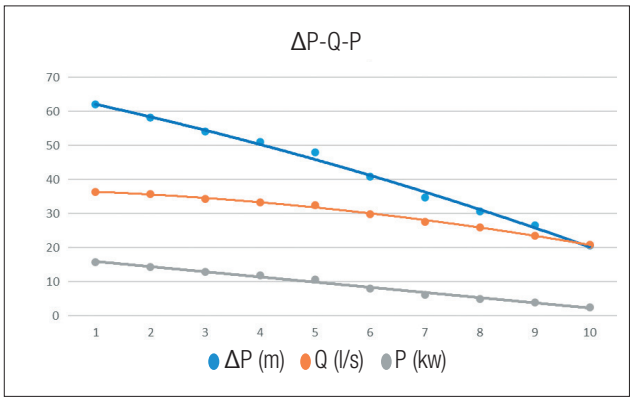


FR LINE

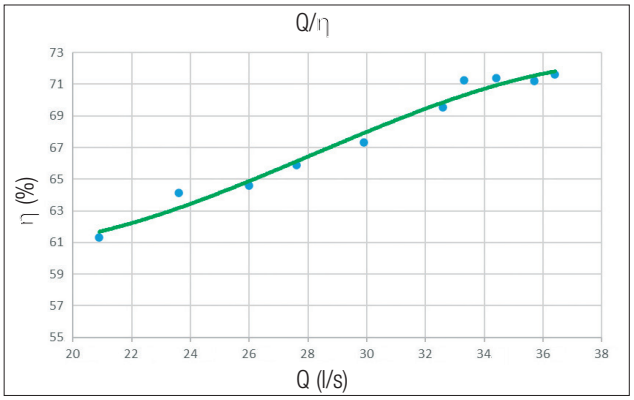
EFFICIENCY

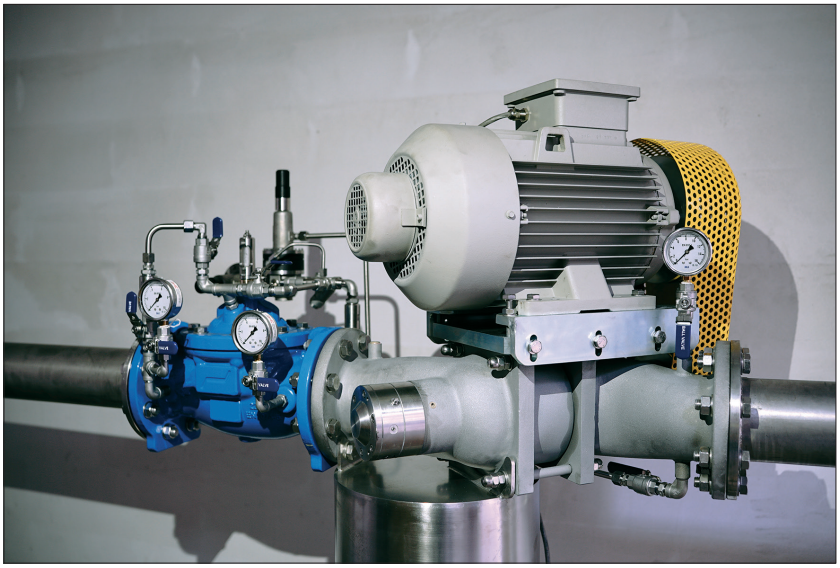
The efficiency of TN groups is, on average, greater than 70% at their nominal flow point (from approx 65% of small TN50 to over 82% of TN350).
It is very important to underline that the tests carried out in our laboratories have confirmed that the performance of the groups does not change significantly as the flow rate varies. See below the results of the tests we conducted on the TN100 group, in our test laboratory, using an electromagnetic brake for load and speed control.

TN100 - TEST REPORT



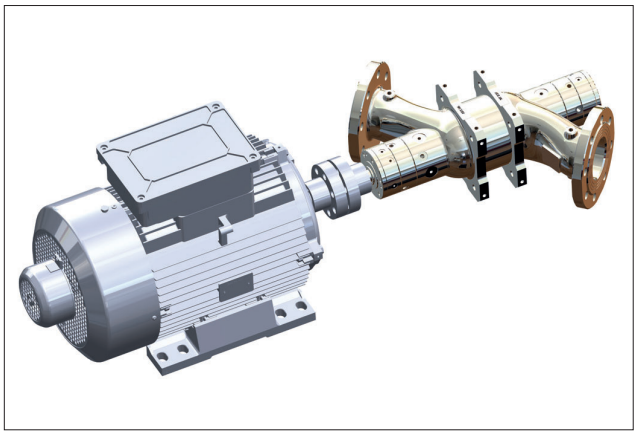
TN100 - TEST REPORT - Q/η

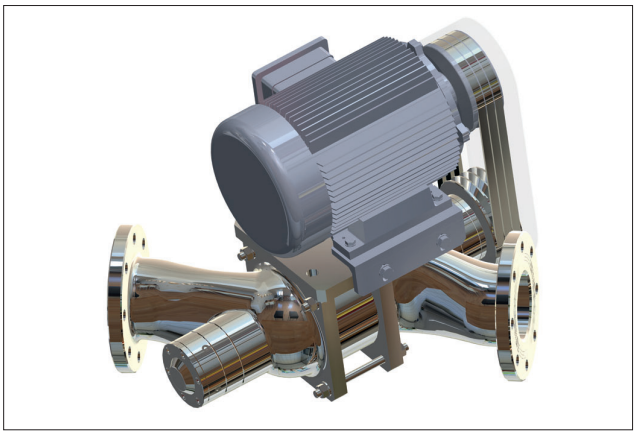


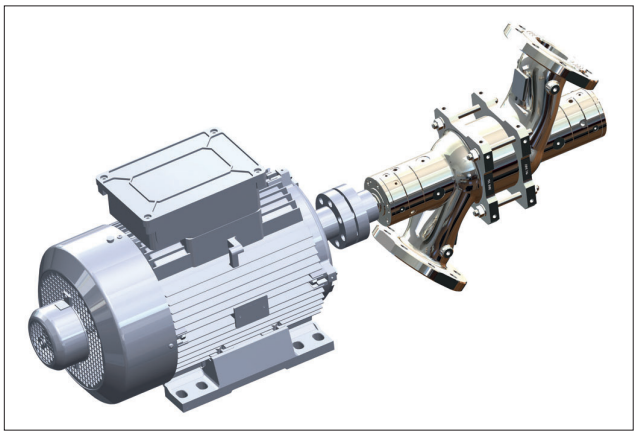


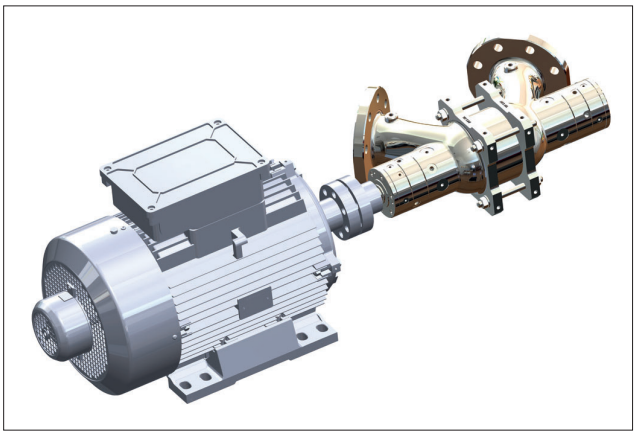
DIMENSIONS & LAYOUT

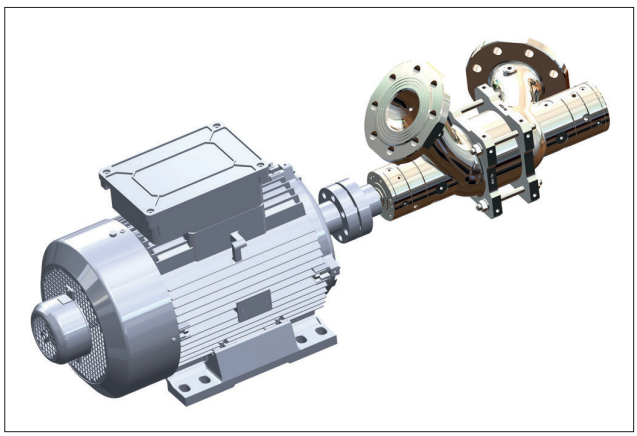
The pressure reducing station overall dimensions are extremely compact, which make it easily adaptable to existing pipelines and infrastructure. The TN groups, having very compact dimensions (for example the distance between the flanges of the TN100 model is only 600mm), can be installed in various configurations, with generators coupled by belts and pulleys or directly with flexible coupling. The inlet and outlet flanges are normally aligned with each other but a simple rotation of a part of the machine body can allow different alignments with the existing pipes.

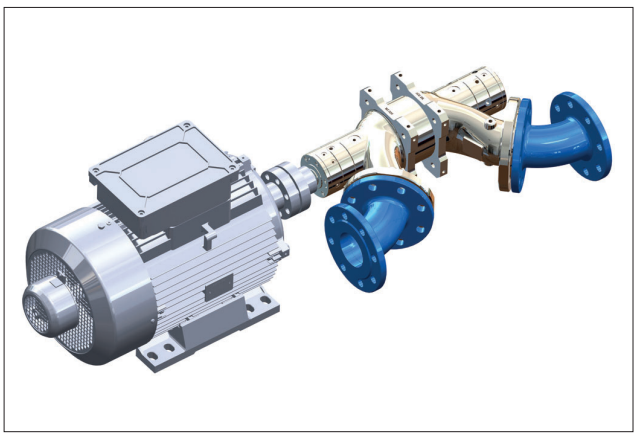








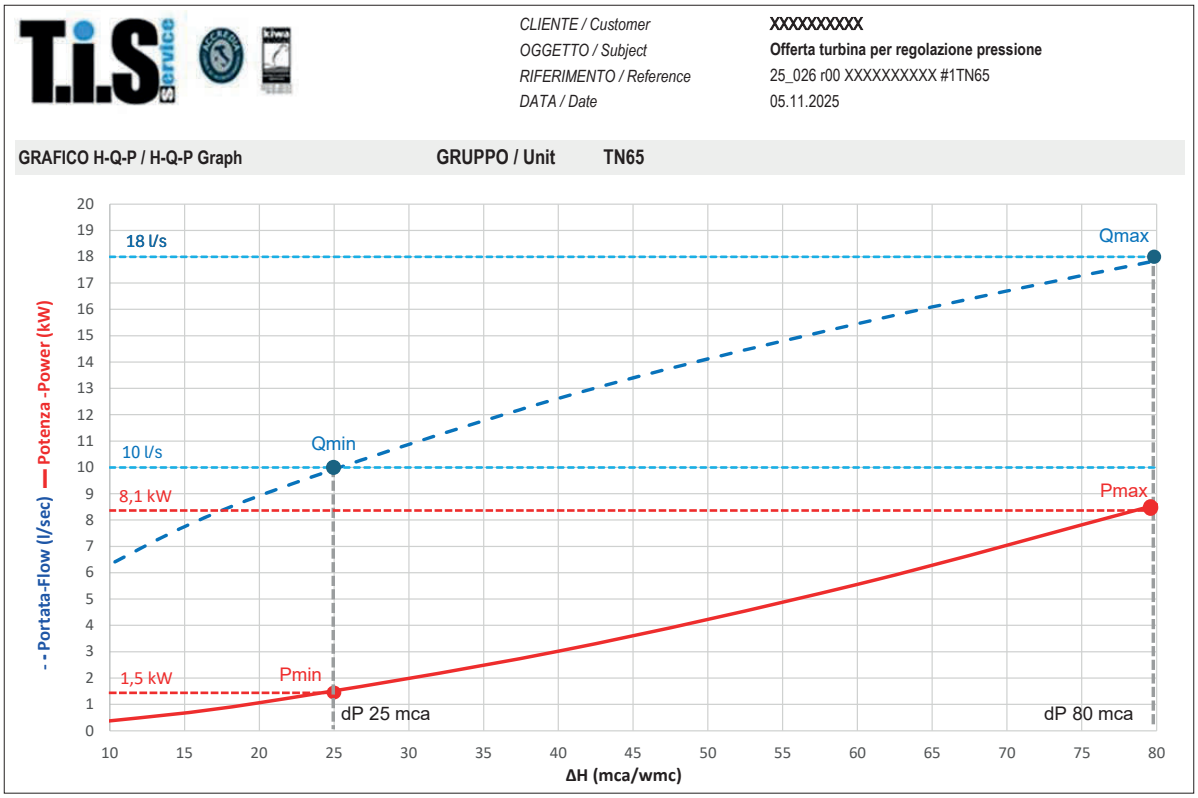




FR LINE

TN GROUP SIZING SOFTWARE

A dedicated software provides accurate sizing of TN GROUP according to the relevant conditions.



Turbina TN

(differenza di salto massima applicabile in turbina: 85 metri; PN massima 400 m) (DN serie 50 65 80 90 100 125 150 180 200 250 300 350)

H salto motore (delta H) disponibile	80,0 m	MAX turbinabile per singola turbina 85 m e max in entrata 400 m
Portata totale disponibile impianto	18.0 l/sec	max delta H in turbina (m) 80
Quota impianto sul livello mare	500 m a.s.l.(definire la quota aprossimata, serve a determinare la sommergenza minima prudenziale allo scarico)	

Combinazioni possibili con gruppi macchine uguali (calcolo con max 5 macchine uguali in parallelo) (per altre combinazioni con coppie differenti fare ricerca scindendo la portata totale disponibile

tipo macchina	TN65	TN80	TN50	TN50	TN50	TN50
numero macchine in parallelo (max tipico 5)	1	1	2	3	4	5
portata per ciascuna macchina (l/sec)	17,8	18,0	9,0	6,0	4,5	3,6
portata in fuga (l/sec)	18,7	18,9	9,5	6,3	4,7	3,8
salto motore necessario turbina (m)	80,0	41,7	44,8	19,9	11,2	7,2
salto totale da dissipare con valvola (m)	0,0	38,3	35,2	60,1	68,8	72,8
velocità nominale (rpm)	4260,7	3144,6	3081,3	2054,2	1540,7	1232,5
velocità fuga (rpm)	7030,1	5188,6	5084,2	3389,4	2542,1	2033,7
rendimenti netti meccanici asse turbina (%)	69%	71%	64%	64%	64%	64%
potenza elettrica attesa globale (kW)	8,6	4,6	4,5	2,0	1,1	0,7
portata globale turbinata (l/sec)	17,8	18,0	18,0	18,0	18,0	18,0
sommergenza minima necessaria allo scarico (m)	8,5	-	1,2	-	-	-

NOTA : la sommergenza minima indica i metri di contropressione che si devono come minimo avere allo scarico della turbina per evitare fenomeni di cavitazione. Calcolo con acqua a temperatur

Portate, potenze (meccanica netta), rendimento asse tipo turbina a salto pieno fissato			
TN350	496,2	323,27	83,1%
TN300	363,9	236,25	82,8%
TN250	252,1	162,31	82,1%
TN200	160,7	101,78	80,7%
TN180	129,9	81,34	79,8%
TN150	89,8	55,28	78,5%
TN125	62,0	37,26	76,6%
TN100	39,4	22,83	73,9%
TN90	31,7	18,01	72,3%
TN80	24,9	13,79	70,5%
TN65	17,8	9,66	69,1%
TN50	12,0	6,04	64,0%
	(l/sec)	(kWm)	Eta (%)

TN GROUP DATA FOR SIZING

Before the order, please provide operating conditions to carry out specific analysis of valve performance.

DATI TECNICI
Technical data

PRESSIONE A MONTE / Upstream pressure ____ bar
PRESSIONE A VALLE / Downstream pressure ____ bar

PORTATA MINIMA / Min flow rate ____ l/s
PORTATA MEDIA / Average flow rate ____ l/s
PORTATA MASSIMA / Max flow rate ____ l/s

PORTATE MEDIE MENSILI
Average monthly flow rates

GENNAIO / January	l/s	FEBBRAIO / February	l/s	MARZO / March	l/s	APRILE / April	l/s
MAGGIO / May	l/s	GIUGNO / June	l/s	LUGLIO / July	l/s	AGOSTO / August	l/s
SETTEMBRE / September	l/s	OTTOBRE / October	l/s	NOVEMBRE / November	l/s	DICEMBRE / December	l/s

QUOTA SUL LIVELLO DEL MARE / Altitude site above sea level ____ mslm masl

DIAMETRO TUBAZIONE IN INGRESSO / Inlet penstock diameter ____ m
DIAMETRO TUBAZIONE IN USCITA / Outlet penstock diameter ____ m

LUNGHEZZA TUBAZIONE IN INGRESSO / Inlet penstock lenght ____ m
LUNGHEZZA TUBAZIONE IN INGRESSO / Outlet penstock lenght ____ m

QUALITA' DELL'ACQUA
Water quality

☐ ACQUA POTABILE / Potable water
TEMPERATURA DELL'ACQUA / Water temperature ____ °C
VALORE pH / pH Value ____

☐ ACQUA NON POTABILE / Non potable water

☐ CONTENUTO ALTAMENTE ABRASIVO/LIMO / Highly abrasive/silt content

DATI ELETTRICI
Electrical data

TENSIONE LINEA / Line voltage ____ V
TENSIONE GENERATORE / Generator voltage ____ V

FREQUENZA LINEA / Line frecuency ____ Hz

NORMATIVE DI CONNESSIONE / Connection ref. normative
☐ CEI 0-21 ☐ CEI 0-16 ☐ Altre / Others

MODO DI OPERAZIONE
Operation mode

☐ NON COLLEGATO ALLA RETE / Off-grid

☐ COLLEGATO ALLA RETE / On-grid

☐ COLLEGAMENTO ALLA RETE NON CONTINUO / Off-grid plus On-grid in combination