Booster sets

MARKET SECTORS

CIVIL, INDUSTRIAL

APPLICATIONS

- Water network supply in condominiums, offices, hotels, shopping centres, factories.
- Water supply to agricultural water networks (e.g. irrigation).

GHV30 Series

SPECIFICATIONS

- **Flow rate** up to 300 m³/h.
- **Head** up to 150 m.
- Electrical panel supply voltage: 3 x 400V ± 10%.
- Frequency: 50 Hz.
- External control voltage: 5 ÷ 10 V.
- Protection class:
  - electrical panel: IP55.
  - converter: IP55 up to 11 kW.
  - IP54 above 11 kW.
- Maximum electric pump power 3 x 22 kW.
- Progressive motor start.
- **Vertical design pump**:
  - SV..T series (motor protection class IP55).
- Maximum operating pressure: 15 bar for sets with SV..T electric pumps.
- Maximum temperature of pumped liquid : +40°C.

MAIN COMPONENTS
of **GHV30** booster sets

- **Three** multistage vertical **electric pumps**, SV series.
- **Hydrovar**® frequency **converters** mounted on the motor of each electric pump.
- One **suction manifold** made of AISI 304 stainless steel, with threaded or flanged ports depending on the type of pump (see drawings). Threaded coupling for water charging.
- One **discharge manifold** made of AISI 304 stainless steel, with threaded or flanged ports depending on the type of pump (see drawings). Fitted with two R1" threaded couplings with caps to allow connection of 24-litre diaphragm tanks.
- **On-off valves** on suction and discharge sides of each pump, ball type with threaded coupling up to 2" size included (for pumps up to SV16 included). Butterfly type for installation between the flanges are used for larger diameter.
- **Non-return valves** on discharge side of each pump, spring – loaded type, with threaded coupling up to 1" 1/2 size. Spring – loaded type for installation between the flanges are large diameters.
- **Pressure gauge and control transmitter** on the pump's discharge side.
- **Miscellaneous** pipe fittings made of nickel-plated brass, galvanised steel and stainless steel.
- **Pump mounting base** and panel mounting bracket made of painted steel.
- **Electrical panel** for control and protection, with metal casing made of painted steel, IP55 protection class, equipped with:
  - Main doorlock switch.
  - Thermal-magnetic protectors for each converter.

  The panel is designed to protect the pumps against dry running; it must be equipped with an external device such as a minimum pressure switch, float switch or electrode probes.
- On request, the sets can be supplied with:
  – non-return valves on suction side (**GHVRA version**);
  – frame-mounted Hydrovar (**HFD or HFS versions**);
  – stainless steel mounting base.

The set comes pre-assembled and tested, complete with operating instructions and panel wiring diagram.

VERSIONS AVAILABLE

STANDARD VERSION (STD)
For general applications
Sets with SV8 pumps:
Nickel plated brass valves, brass non-return valves, stainless steel manifolds.
Sets with SV16 pumps:
Nickel plated brass valves, non-return valves with stainless steel flaps.
Sets with SV33-46-66-92 pumps:
Valves with polyamide butterfly, non-return valves with stainless steel flaps.

DW VERSION
For drinking water applications.
The main components in contact with the liquid are certified suitable for drinking water or are made of AISI 304 or higher grade of stainless steel.
Fitted with vibration damping feet.
Sets with SV8 pumps:
Nickel-plated brass valves, brass non-return valves.
Sets with SV16 pumps:
Nickel-plated brass valves, non-return valves with stainless steel flaps.
Sets with SV33-46-66-92 pumps:
Valves with epoxy butterfly, non-return valves with stainless steel flaps.

AISI 304, AISI 316 version
For special applications.
Sets with SV8-16-33-46-66-92 pumps:
Manifolds, valves, non-return valves and main components with parts directly in contact with the pumped liquid are made of AISI 304 or AISI 316 stainless steel.
Fitted with vibration damping feet.

Accessories available on request:
– Vibration dampers kit (1 kit per pump).
– Devices against dry running:
  float switch, minimum pressure switch, probe electrodes kit.
– Kit featuring a 24-litre diaphragm expansion tank equipped with a ball valve (one for each pump) in the following versions:
  24-litre 8 bar cylinder water tank kit
  24-litre 10 bar cylinder water tank kit
  24-litre 16 bar cylinder water tank kit.

GHV30 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV 30 RA	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV802F11T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	891	973
SV803F15T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	939	973
SV804F22T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	977	973
SV805F22T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	1015	973
SV806F30T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	1103	973
SV808F40T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	1183	973
SV809F40T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	1221	973
SV811F55T	R 2"1/2	R 2"1/2	397	497	302	356	775	929	1040	160	748	1384	973

Dimensions in mm. Tolerance ± 10 mm.

ghv30ra_sv8_a_td

GHV30 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV 30	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV802F11T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	891	973
SV803F15T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	939	973
SV804F22T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	977	973
SV805F22T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	1015	973
SV806F30T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	1103	973
SV808F40T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	1183	973
SV809F40T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	1221	973
SV811F55T	R 2"1/2	R 2"1/2	302	356	397	497	886	986	1040	160	748	1384	973

Dimensions in mm. Tolerance ± 10 mm.

ghv30_sv8_a_td

GHV30 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV 30 RA	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV1602F22T	100	80	410	478	341	423	961	1111	1084	170	765	911	973
SV1603F30T	100	80	410	478	341	423	961	1111	1084	170	765	999	973
SV1604F40T	100	80	410	478	341	423	961	1111	1084	170	765	1041	973
SV1605F55T	100	80	410	478	341	423	961	1111	1084	170	765	1166	973
SV1606F55T	100	80	410	478	341	423	961	1111	1084	170	765	1204	973
SV1607F75T	100	80	410	478	341	423	961	1111	1084	170	765	1242	973
SV1608F75T	100	80	410	478	341	423	961	1111	1084	170	765	1280	973

Dimensions in mm. Tolerance ± 10 mm.

ghv30ra_sv16_a_td

GHV30 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV 30	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV1602F22T	100	80	353	435	398	466	961	986	1084	170	765	911	973
SV1603F30T	100	80	353	435	398	466	961	986	1084	170	765	999	973
SV1604F40T	100	80	353	435	398	466	961	986	1084	170	765	1041	973
SV1605F55T	100	80	353	435	398	466	961	986	1084	170	765	1166	973
SV1606F55T	100	80	353	435	398	466	961	986	1084	170	765	1204	973
SV1607F75T	100	80	353	435	398	466	961	986	1084	170	765	1242	973
SV1608F75T	100	80	353	435	398	466	961	986	1084	170	765	1280	973

Dimensions in mm. Tolerance ± 10 mm.

ghv30_sv16_a_td

GHV30 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV_GHV30RA-SV46_A_DD

GHV30 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV 30RA	DNA	DNM	A	B	C	D	E	F	G	H	H1	H2	H3
SV3301/1F22T	125	100	726	448	1409	110	1220	110	1220	215	822	1047	974
SV3301F30T	125	100	726	448	1409	110	1220	110	1220	215	822	1087	974
SV3302/2F40T	125	100	726	448	1409	110	1220	110	1220	215	822	1166	974
SV3302/1F40T	125	100	726	448	1409	110	1220	110	1220	215	822	1166	974
SV3302F55T	125	100	726	448	1409	110	1220	110	1220	215	822	1253	974
SV3303/2F55T	125	100	726	448	1409	110	1220	110	1220	215	822	1328	974
SV3303/1F75T	125	100	726	448	1409	110	1220	110	1220	215	822	1328	974
SV3303F75T	125	100	726	448	1409	110	1220	110	1220	215	822	1328	974
SV3304/2F75T	125	100	726	448	1409	110	1220	110	1220	215	822	1403	974
SV3304/1F110T	125	100	726	448	1409	110	1220	110	1220	215	822	1491	974
SV3304F110T	125	100	726	448	1409	110	1220	110	1220	215	822	1491	974
SV3305/2F110T	125	100	726	448	1409	110	1220	110	1220	215	822	1566	974
SV3305/1F110T	125	100	726	448	1409	110	1220	110	1220	215	822	1566	974
SV3305F150T	125	100	726	448	1409	110	1220	110	1220	215	822	1742	974
SV3306/2F150T	125	100	726	448	1409	110	1220	110	1220	215	822	1817	974
SV3306/1F150T	125	100	726	448	1409	110	1220	110	1220	215	822	1817	974
SV3306F150T	125	100	726	448	1409	110	1220	110	1220	215	822	1817	974
SV3307/2F150T	125	100	726	448	1409	110	1220	110	1220	215	822	1892	974
SV4601/1F30T	150	125	766	484	1517	110	1220	90	1260	250	870	1127	974
SV4601F40T	150	125	766	484	1517	110	1220	90	1260	250	870	1131	974
SV4602/2F55T	150	125	766	484	1517	110	1220	90	1260	250	870	1293	974
SV4602F75T	150	125	766	484	1517	110	1220	90	1260	250	870	1293	974
SV4603/2F110T	150	125	766	484	1517	110	1220	90	1260	250	870	1456	1194
SV4603F110T	150	125	766	484	1517	110	1220	90	1260	250	870	1456	1194
SV4604/2F150T	150	125	766	484	1517	110	1220	90	1260	250	870	1707	1194
SV4604F150T	150	125	766	484	1517	110	1220	90	1260	250	870	1707	1194
SV4605/2F185T	150	125	766	484	1517	110	1220	90	1260	250	870	1826	1194
SV4605F185T	150	125	766	484	1517	110	1220	90	1260	250	870	1826	1194
SV4606/2F220T	150	125	766	484	1517	110	1220	90	1260	250	870	1901	1194
SV4606F220T	150	125	766	484	1517	110	1220	90	1260	250	870	1901	1194
SV6601/1F40T	200	150	819	504	1635	90	1260	90	1260	250	884	1156	1194
SV6601F55T	200	150	819	504	1635	90	1260	90	1260	250	884	1243	1194
SV6602/2F75T	200	150	819	504	1635	90	1260	90	1260	250	884	1333	1194
SV6602/1F110T	200	150	819	504	1635	90	1260	90	1260	250	884	1421	1194
SV6602F110T	200	150	819	504	1635	90	1260	90	1260	250	884	1421	1194
SV6603/2F150T	200	150	819	504	1635	90	1260	90	1260	250	884	1687	1194
SV6603/1F150T	200	150	819	504	1635	90	1260	90	1260	250	884	1687	1194
SV6603F185T	200	150	819	504	1635	90	1260	90	1260	250	884	1731	1194
SV6604/2F185T	200	150	819	504	1635	90	1260	90	1260	250	884	1821	1194
SV6604/1F220T	200	150	819	504	1635	90	1260	90	1260	250	884	1821	1194
SV6604F220T	200	150	819	504	1635	90	1260	90	1260	250	884	1821	1194
SV9201/1F55T	200	200	819	529	1688	90	1260	90	1260	250	910	1243	1194
SV9201F75T	200	200	819	529	1688	90	1260	90	1260	250	910	1243	1194
SV9202/2F110T	200	200	819	529	1688	90	1260	90	1260	250	910	1421	1194
SV9202F150T	200	200	819	529	1688	90	1260	90	1260	250	910	1597	1194
SV9203/2F185T	200	200	819	529	1688	90	1260	90	1260	250	910	1731	1194
SV9203F220T	200	200	819	529	1688	90	1260	90	1260	250	910	1731	1194

Dimensions in mm. Tolerance ± 10 mm.

ghv30ra_sv46_a_td

GHV30 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV_GHV30-SV46_A_DD

GHV30 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV 30	DNA	DNM	A	B	C	D	E	F	G	H	H1	H2	H3
SV3301/1F22T	125	100	461	713	1409	110	1220	110	1220	215	822	1047	974
SV3301F30T	125	100	461	713	1409	110	1220	110	1220	215	822	1087	974
SV3302/2F40T	125	100	461	713	1409	110	1220	110	1220	215	822	1166	974
SV3302/1F40T	125	100	461	713	1409	110	1220	110	1220	215	822	1166	974
SV3302F55T	125	100	461	713	1409	110	1220	110	1220	215	822	1253	974
SV3303/2F55T	125	100	461	713	1409	110	1220	110	1220	215	822	1328	974
SV3303/1F75T	125	100	461	713	1409	110	1220	110	1220	215	822	1328	974
SV3303F75T	125	100	461	713	1409	110	1220	110	1220	215	822	1328	974
SV3304/2F75T	125	100	461	713	1409	110	1220	110	1220	215	822	1403	974
SV3304/1F110T	125	100	461	713	1409	110	1220	110	1220	215	822	1491	974
SV3304F110T	125	100	461	713	1409	110	1220	110	1220	215	822	1491	974
SV3305/2F110T	125	100	461	713	1409	110	1220	110	1220	215	822	1566	974
SV3305/1F110T	125	100	461	713	1409	110	1220	110	1220	215	822	1566	974
SV3305F150T	125	100	461	713	1409	110	1220	110	1220	215	822	1742	974
SV3306/2F150T	125	100	461	713	1409	110	1220	110	1220	215	822	1817	974
SV3306/1F150T	125	100	461	713	1409	110	1220	110	1220	215	822	1817	974
SV3306F150T	125	100	461	713	1409	110	1220	110	1220	215	822	1817	974
SV3307/2F150T	125	100	461	713	1409	110	1220	110	1220	215	822	1892	974
SV4601/1F30T	150	125	498	752	1517	110	1220	90	1260	250	870	1127	974
SV4601F40T	150	125	498	752	1517	110	1220	90	1260	250	870	1131	974
SV4602/2F55T	150	125	498	752	1517	110	1220	90	1260	250	870	1293	974
SV4602F75T	150	125	498	752	1517	110	1220	90	1260	250	870	1293	974
SV4603/2F110T	150	125	498	752	1517	110	1220	90	1260	250	870	1456	1194
SV4603F110T	150	125	498	752	1517	110	1220	90	1260	250	870	1456	1194
SV4604/2F150T	150	125	498	752	1517	110	1220	90	1260	250	870	1707	1194
SV4604F150T	150	125	498	752	1517	110	1220	90	1260	250	870	1707	1194
SV4605/2F185T	150	125	498	752	1517	110	1220	90	1260	250	870	1826	1194
SV4605F185T	150	125	498	752	1517	110	1220	90	1260	250	870	1826	1194
SV4606/2F220T	150	125	498	752	1517	110	1220	90	1260	250	870	1901	1194
SV4606F220T	150	125	498	752	1517	110	1220	90	1260	250	870	1901	1194
SV6601/1F40T	200	150	529	794	1635	90	1260	90	1260	250	884	1156	1194
SV6601F55T	200	150	529	794	1635	90	1260	90	1260	250	884	1243	1194
SV6602/2F75T	200	150	529	794	1635	90	1260	90	1260	250	884	1333	1194
SV6602/1F110T	200	150	529	794	1635	90	1260	90	1260	250	884	1421	1194
SV6602F110T	200	150	529	794	1635	90	1260	90	1260	250	884	1421	1194
SV6603/2F150T	200	150	529	794	1635	90	1260	90	1260	250	884	1687	1194
SV6603/1F150T	200	150	529	794	1635	90	1260	90	1260	250	884	1687	1194
SV6603F185T	200	150	529	794	1635	90	1260	90	1260	250	884	1731	1194
SV6604/2F185T	200	150	529	794	1635	90	1260	90	1260	250	884	1821	1194
SV6604/1F220T	200	150	529	794	1635	90	1260	90	1260	250	884	1821	1194
SV6604F220T	200	150	529	794	1635	90	1260	90	1260	250	884	1821	1194
SV9201/1F55T	200	200	529	819	1688	90	1260	90	1260	250	910	1243	1194
SV9201F75T	200	200	529	819	1688	90	1260	90	1260	250	910	1243	1194
SV9202/2F110T	200	200	529	819	1688	90	1260	90	1260	250	910	1421	1194
SV9202F150T	200	200	529	819	1688	90	1260	90	1260	250	910	1597	1194
SV9203/2F185T	200	200	529	819	1688	90	1260	90	1260	250	910	1731	1194
SV9203F220T	200	200	529	819	1688	90	1260	90	1260	250	910	1731	1194

Dimensions in mm. Tolerance ± 10 mm.

ghv30_sv46_a_td

Booster sets

MARKET SECTORS

CIVIL, INDUSTRIAL

APPLICATIONS

- Water network supply in condominiums, offices, hotels, shopping centres, factories.
- Water supply to agricultural water networks (e.g. irrigation).

GHV40 Series

SPECIFICATIONS

- **Flow rate** up to 400 m³/h.
- **Head** up to 150 m.
- Electrical panel supply voltage: 3 x 400V ± 10%.
- Frequency: 50 Hz.
- External control voltage: 5 ÷ 10 V.
- Protection class:
  - electrical panel: IP55.
  - converter: IP55 up to 11 kW.
  - IP54 above 11 kW.
- Maximum electric pump power 4 x 22 kW.
- Progressive motor start.
- **Vertical design pump**:
  - SV..T series (motor protection class IP55).
- Maximum operating pressure: 15 bar for sets with SV..T electric pumps.
- Maximum temperature of pumped liquid : +40°C.

MAIN COMPONENTS
of **GHV40** booster sets

- **Four** multistage vertical **electric pumps**, SV series.
- **Hydrovar**® frequency **converters** mounted on the motor of each electric pump.
- One **suction manifold** made of AISI 304 stainless steel, with threaded or flanged ports depending on the type of pump (see drawings). Threaded coupling for water charging.
- One **discharge manifold** made of AISI 304 stainless steel, with threaded or flanged ports depending on the type of pump (see drawings). Fitted with two R1" threaded couplings with caps to allow connection of 24-litre diaphragm tanks.
- **On-off valves** on suction and discharge sides of each pump, ball type with threaded coupling up to 2" size included (for pumps up to SV16 included). Butterfly type for installation between the flanges are used for larger diameter.
- **Non-return valves** on discharge side of each pump, spring – loaded type, with threaded coupling up to 1" 1/2 size. Spring – loaded type for installation between the flanges are large diameters.
- **Pressure gauge and control transmitter** on the pump's discharge side.
- **Miscellaneous** pipe fittings made of nickel-plated brass, galvanised steel and stainless steel.
- **Pump mounting base** and panel mounting bracket made of painted steel.
- **Electrical panel** for control and protection, with metal casing made of painted steel, IP55 protection class, equipped with:
  - Main doorlock switch.
  - Thermal-magnetic protectors for each converter.

  The panel is designed to protect the pumps against dry running; it must be equipped with an external device such as a minimum pressure switch, float switch or electrode probes.
- On request, the sets can be supplied with:
  – non-return valves on suction side (**GHVRA version**);
  – frame-mounted Hydrovar (**HFD or HFS versions**);
  – stainless steel mounting base.

The set comes pre-assembled and tested, complete with operating instructions and panel wiring diagram.

VERSIONS AVAILABLE

STANDARD VERSION (STD)
For general applications
Sets with SV8 pumps:
Nickel plated brass valves, brass non-return valves, stainless steel manifolds.
Sets with SV16 pumps:
Nickel plated brass valves, non-return valves with stainless steel flaps.
Sets with SV33-46-66-92 pumps:
Valves with polyamide butterfly, non-return valves with stainless steel flaps.

DW VERSION
For drinking water applications.
The main components in contact with the liquid are certified suitable for drinking water or are made of AISI 304 or higher grade of stainless steel.
Fitted with vibration damping feet.
Sets with SV8 pumps:
Nickel-plated brass valves, brass non-return valves.
Sets with SV16 pumps:
Nickel-plated brass valves, non-return valves with stainless steel flaps.
Sets with SV33-46-66-92 pumps:
Valves with epoxy butterfly, non-return valves with stainless steel flaps.

AISI 304, AISI 316 version
For special applications.
Sets with SV8-16-33-46-66-92 pumps:
Manifolds, valves, non-return valves and main components with parts directly in contact with the pumped liquid are made of AISI 304 or AISI 316 stainless steel.
Fitted with vibration damping feet.

Accessories available on request:
– Vibration dampers kit (1 kit per pump).
– Devices against dry running:
  float switch, minimum pressure switch, probe electrodes kit.
– Kit featuring a 24-litre diaphragm expansion tank equipped with a ball valve (one for each pump) in the following versions:
  24-litre 8 bar cylinder water tank kit
  24-litre 10 bar cylinder water tank kit
  24-litre 16 bar cylinder water tank kit.

GHV40 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV 40 RA	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV802F11T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	891	973
SV803F15T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	939	973
SV804F22T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	977	973
SV805F22T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	1015	973
SV806F30T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	1103	973
SV808F40T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	1183	973
SV809F40T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	1221	973
SV811F55T	R 3"	R 3"	404	504	309	363	801	955	1410	160	755	1384	973

Dimensions in mm. Tolerance ± 10 mm.

ghv40ra_sv8_a_td

GHV40 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV 40	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV802F11T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	891	973
SV803F15T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	939	973
SV804F22T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	977	973
SV805F22T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	1015	973
SV806F30T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	1103	973
SV808F40T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	1183	973
SV809F40T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	1221	973
SV811F55T	R 3"	R 3"	309	363	404	504	899	999	1410	160	755	1384	973

Dimensions in mm. Tolerance ± 10 mm.

ghv40_sv8_a_td

GHV40 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV 40 RA	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV1602F22T	100	100	410	478	353	435	801	955	1454	170	777	911	973
SV1603F30T	100	100	410	478	353	435	801	955	1454	170	777	999	973
SV1604F40T	100	100	410	478	353	435	801	955	1454	170	777	1041	973
SV1605F55T	100	100	410	478	353	435	801	955	1454	170	777	1166	973
SV1606F55T	100	100	410	478	353	435	801	955	1454	170	777	1204	973
SV1607F75T	100	100	410	478	353	435	801	955	1454	170	777	1242	1093
SV1608F75T	100	100	410	478	353	435	801	955	1454	170	777	1280	1093

Dimensions in mm. Tolerance ± 10 mm.

ghv40ra_sv16_a_td

GHV40 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV 40	DNA	DNM	A		B		C		D	H	H1	H2	H3
			STD/DW	AISI	STD/DW	AISI	STD/DW	AISI					
SV1602F22T	100	100	353	435	410	478	983	1133	1454	170	777	911	973
SV1603F30T	100	100	353	435	410	478	983	1133	1454	170	777	999	973
SV1604F40T	100	100	353	435	410	478	983	1133	1454	170	777	1041	973
SV1605F55T	100	100	353	435	410	478	983	1133	1454	170	777	1166	973
SV1606F55T	100	100	353	435	410	478	983	1133	1454	170	777	1204	973
SV1607F75T	100	100	353	435	410	478	983	1133	1454	170	777	1242	1093
SV1608F75T	100	100	353	435	410	478	983	1133	1454	170	777	1280	1093

Dimensions in mm. Tolerance ± 10 mm.

ghv40_sv16_a_td

GHV40 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV_GHV40RA-SV46_A_DD

GHV40 RA SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON SUCTION SIDE - THREE-PHASE POWER SUPPLY

GHV40RA	DNA	DNM	A	B	C	D	E	F	G	H	H1	H2	H3
SV3301/1F22T	125	125	726	461	1437	110	1660	110	1660	215	835	1047	974
SV3301F30T	125	125	726	461	1437	110	1660	110	1660	215	835	1087	974
SV3302/2F40T	125	125	726	461	1437	110	1660	110	1660	215	835	1166	974
SV3302/1F40T	125	125	726	461	1437	110	1660	110	1660	215	835	1166	974
SV3302F55T	125	125	726	461	1437	110	1660	110	1660	215	835	1253	974
SV3303/2F55T	125	125	726	461	1437	110	1660	110	1660	215	835	1328	974
SV3303/1F75T	125	125	726	461	1437	110	1660	110	1660	215	835	1328	1194
SV3303F75T	125	125	726	461	1437	110	1660	110	1660	215	835	1328	1194
SV3304/2F75T	125	125	726	461	1437	110	1660	110	1660	215	835	1403	1194
SV3304/1F110T	125	125	726	461	1437	110	1660	110	1660	215	835	1491	1194
SV3304F110T	125	125	726	461	1437	110	1660	110	1660	215	835	1491	1194
SV3305/2F110T	125	125	726	461	1437	110	1660	110	1660	215	835	1566	1194
SV3305/1F110T	125	125	726	461	1437	110	1660	110	1660	215	835	1566	1194
SV3305F150T	125	125	726	461	1437	110	1660	110	1660	215	835	1742	1194
SV3306/2F150T	125	125	726	461	1437	110	1660	110	1660	215	835	1817	1194
SV3306/1F150T	125	125	726	461	1437	110	1660	110	1660	215	835	1817	1194
SV3306F150T	125	125	726	461	1437	110	1660	110	1660	215	835	1817	1194
SV3307/2F150T	125	125	726	461	1437	110	1660	110	1660	215	835	1892	1194
SV4601/1F30T	150	150	766	498	1548	90	1700	90	1700	250	884	1127	974
SV4601F40T	150	150	766	498	1548	90	1700	90	1700	250	884	1131	974
SV4602/2F55T	150	150	766	498	1548	90	1700	90	1700	250	884	1293	1194
SV4602F75T	150	150	766	498	1548	90	1700	90	1700	250	884	1293	1194
SV4603/2F110T	150	150	766	498	1548	90	1700	90	1700	250	884	1456	1194
SV4603F110T	150	150	766	498	1548	90	1700	90	1700	250	884	1456	1194
SV4604/2F150T	150	150	766	498	1548	90	1700	90	1700	250	884	1707	1194
SV4604F150T	150	150	766	498	1548	90	1700	90	1700	250	884	1707	1194
SV4605/2F185T	150	150	766	498	1548	90	1700	90	1700	250	884	1826	1321
SV4605F185T	150	150	766	498	1548	90	1700	90	1700	250	884	1826	1321
SV4606/2F220T	150	150	766	498	1548	90	1700	90	1700	250	884	1901	1321
SV4606F220T	150	150	766	498	1548	90	1700	90	1700	250	884	1901	1321
SV6601/1F40T	200	200	819	529	1688	90	1700	90	1700	250	910	1156	1194
SV6601F55T	200	200	819	529	1688	90	1700	90	1700	250	910	1243	1194
SV6602/2F75T	200	200	819	529	1688	90	1700	90	1700	250	910	1333	1194
SV6602/1F110T	200	200	819	529	1688	90	1700	90	1700	250	910	1421	1194
SV6602F110T	200	200	819	529	1688	90	1700	90	1700	250	910	1421	1194
SV6603/2F150T	200	200	819	529	1688	90	1700	90	1700	250	910	1687	1194
SV6603/1F150T	200	200	819	529	1688	90	1700	90	1700	250	910	1687	1194
SV6603F185T	200	200	819	529	1688	90	1700	90	1700	250	910	1731	1321
SV6604/2F185T	200	200	819	529	1688	90	1700	90	1700	250	910	1821	1321
SV6604/1F220T	200	200	819	529	1688	90	1700	90	1700	250	910	1821	1321
SV6604F220T	200	200	819	529	1688	90	1700	90	1700	250	910	1821	1321
SV9201/1F55T	250	200	846	529	1748	90	1700	60	1760	250	910	1243	1194
SV9201F75T	250	200	846	529	1748	90	1700	60	1760	250	910	1243	1194
SV9202/2F110T	250	200	846	529	1748	90	1700	60	1760	250	910	1421	1194
SV9202F150T	250	200	846	529	1748	90	1700	60	1760	250	910	1597	1194
SV9203/2F185T	250	200	846	529	1748	90	1700	60	1760	250	910	1731	1321
SV9203F220T	250	200	846	529	1748	90	1700	60	1760	250	910	1731	1321

Dimensions in mm. Tolerance ± 10 mm.

ghv40ra_sv46_a_td

GHV40 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV_GHV40-SV46_A_DD

GHV40 SERIES BOOSTER SETS
THREE VERTICAL ELECTRIC PUMPS WITH NON-RETURN VALVE ON DISCHARGE SIDE - THREE-PHASE POWER SUPPLY

GHV40	DNA	DNM	A	B	C	D	E	F	G	H	H1	H2	H3
SV3301/1F22T	125	125	461	726	1437	110	1660	110	1660	215	835	1047	974
SV3301F30T	125	125	461	726	1437	110	1660	110	1660	215	835	1087	974
SV3302/2F40T	125	125	461	726	1437	110	1660	110	1660	215	835	1166	974
SV3302/1F40T	125	125	461	726	1437	110	1660	110	1660	215	835	1166	974
SV3302F55T	125	125	461	726	1437	110	1660	110	1660	215	835	1253	974
SV3303/2F55T	125	125	461	726	1437	110	1660	110	1660	215	835	1328	974
SV3303/1F75T	125	125	461	726	1437	110	1660	110	1660	215	835	1328	1194
SV3303F75T	125	125	461	726	1437	110	1660	110	1660	215	835	1328	1194
SV3304/2F75T	125	125	461	726	1437	110	1660	110	1660	215	835	1403	1194
SV3304/1F110T	125	125	461	726	1437	110	1660	110	1660	215	835	1491	1194
SV3304F110T	125	125	461	726	1437	110	1660	110	1660	215	835	1491	1194
SV3305/2F110T	125	125	461	726	1437	110	1660	110	1660	215	835	1566	1194
SV3305/1F110T	125	125	461	726	1437	110	1660	110	1660	215	835	1566	1194
SV3305F150T	125	125	461	726	1437	110	1660	110	1660	215	835	1742	1194
SV3306/2F150T	125	125	461	726	1437	110	1660	110	1660	215	835	1817	1194
SV3306/1F150T	125	125	461	726	1437	110	1660	110	1660	215	835	1817	1194
SV3306F150T	125	125	461	726	1437	110	1660	110	1660	215	835	1817	1194
SV3307/2F150T	125	125	461	726	1437	110	1660	110	1660	215	835	1892	1194
SV4601/1F30T	150	150	498	766	1548	90	1700	90	1700	250	884	1127	974
SV4601F40T	150	150	498	766	1548	90	1700	90	1700	250	884	1131	974
SV4602/2F55T	150	150	498	766	1548	90	1700	90	1700	250	884	1293	1194
SV4602F75T	150	150	498	766	1548	90	1700	90	1700	250	884	1293	1194
SV4603/2F110T	150	150	498	766	1548	90	1700	90	1700	250	884	1456	1194
SV4603F110T	150	150	498	766	1548	90	1700	90	1700	250	884	1456	1194
SV4604/2F150T	150	150	498	766	1548	90	1700	90	1700	250	884	1707	1194
SV4604F150T	150	150	498	766	1548	90	1700	90	1700	250	884	1707	1194
SV4605/2F185T	150	150	498	766	1548	90	1700	90	1700	250	884	1826	1321
SV4605F185T	150	150	498	766	1548	90	1700	90	1700	250	884	1826	1321
SV4606/2F220T	150	150	498	766	1548	90	1700	90	1700	250	884	1901	1321
SV4606F220T	150	150	498	766	1548	90	1700	90	1700	250	884	1901	1321
SV6601/1F40T	200	200	529	819	1688	90	1700	90	1700	250	910	1156	1194
SV6601F55T	200	200	529	819	1688	90	1700	90	1700	250	910	1243	1194
SV6602/2F75T	200	200	529	819	1688	90	1700	90	1700	250	910	1333	1194
SV6602/1F110T	200	200	529	819	1688	90	1700	90	1700	250	910	1421	1194
SV6602F110T	200	200	529	819	1688	90	1700	90	1700	250	910	1421	1194
SV6603/2F150T	200	200	529	819	1688	90	1700	90	1700	250	910	1687	1194
SV6603/1F150T	200	200	529	819	1688	90	1700	90	1700	250	910	1687	1194
SV6603F185T	200	200	529	819	1688	90	1700	90	1700	250	910	1731	1321
SV6604/2F185T	200	200	529	819	1688	90	1700	90	1700	250	910	1821	1321
SV6604/1F220T	200	200	529	819	1688	90	1700	90	1700	250	910	1821	1321
SV6604F220T	200	200	529	819	1688	90	1700	90	1700	250	910	1821	1321
SV9201/1F55T	250	200	556	819	1748	90	1700	60	1760	250	910	1243	1194
SV9201F75T	250	200	556	819	1748	90	1700	60	1760	250	910	1243	1194
SV9202/2F110T	250	200	556	819	1748	90	1700	60	1760	250	910	1421	1194
SV9202F150T	250	200	556	819	1748	90	1700	60	1760	250	910	1597	1194
SV9203/2F185T	250	200	556	819	1748	90	1700	60	1760	250	910	1731	1321
SV9203F220T	250	200	556	819	1748	90	1700	60	1760	250	910	1731	1321

Dimensions in mm. Tolerance ± 10 mm.

ghv40_sv46_a_td

BOOSTER SETS - GHV10 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV205		ISO 9906 - Annex A

SV206		ISO 9906 - Annex A

SV207		ISO 9906 - Annex A

SV208		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one pump operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV209		ISO 9906 - Annex A

SV211		ISO 9906 - Annex A

SV212		ISO 9906 - Annex A

SV214		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one pump operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV404		ISO 9906 - Annex A

SV405		ISO 9906 - Annex A

SV406		ISO 9906 - Annex A

SV407		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one pump operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV408 | ISO 9906 - Annex A

SV409 | ISO 9906 - Annex A

SV411 | ISO 9906 - Annex A

SV413 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one pump operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV414		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one pump operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV20 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV204M - SV204T | ISO 9906 - Annex A

SV206M - SV206T | ISO 9906 - Annex A

SV208M - SV208T | ISO 9906 - Annex A

SV209M - SV209T | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one and two pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV20 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV211M - SV211T | ISO 9906 - Annex A

SV212M - SV212T | ISO 9906 - Annex A

SV214M - SV214T | ISO 9906 - Annex A

SV403M - SV403T | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one and two pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV20 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV404M - SV404T | ISO 9906 - Annex A

SV407M - SV407T | ISO 9906 - Annex A

SV409M - SV409T | ISO 9906 - Annex A

SV413M - SV413T | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one and two pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV20 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV414T		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one and two pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV3301/1 | ISO 9906 - Annex A

SV3301 | ISO 9906 - Annex A

SV3302/2 | ISO 9906 - Annex A

SV3302/1 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV3302 | ISO 9906 - Annex A

SV3303/2 | ISO 9906 - Annex A

SV3303/1 | ISO 9906 - Annex A

SV3303 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV3304/2 | ISO 9906 - Annex A

SV3304/1 | ISO 9906 - Annex A

SV3304 | ISO 9906 - Annex A

SV3305/2 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV3305/1 | ISO 9906 - Annex A

SV3305 | ISO 9906 - Annex A

SV3306/2 | ISO 9906 - Annex A

SV3306/1 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV3306		ISO 9906 - Annex A

SV3307/2		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV4601/1		ISO 9906 - Annex A

SV4601		ISO 9906 - Annex A

SV4602/2		ISO 9906 - Annex A

SV4602		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV4603/2		ISO 9906 - Annex A

SV4603		ISO 9906 - Annex A

SV4604/2		ISO 9906 - Annex A

SV4604		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV4605/2 | ISO 9906 - Annex A

SV4605 | ISO 9906 - Annex A

SV4606/2 | ISO 9906 - Annex A

SV4606 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV6601/1 | ISO 9906 - Annex A

SV6601 | ISO 9906 - Annex A

SV6602/2 | ISO 9906 - Annex A

SV6602/1 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV6602 | ISO 9906 - Annex A

SV6603/2 | ISO 9906 - Annex A

SV6603/1 | ISO 9906 - Annex A

SV6603 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV6604/2 | ISO 9906 - Annex A

SV6604/1 | ISO 9906 - Annex A

SV6604 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV9201/1 | ISO 9906 - Annex A

SV9201 | ISO 9906 - Annex A

SV9202/2 | ISO 9906 - Annex A

SV9202 | ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

BOOSTER SETS - GHV10..40 SERIES
OPERATING CHARACTERISTICS AT 30..50 Hz

SV9203/2		ISO 9906 - Annex A

SV9203		ISO 9906 - Annex A

The performance curves do not take into account flow resistance in the valves and piping.
The curves show the performance with one, two, three and four pumps operating at minimum and maximum speed.
These performances are valid for liquids with density $\rho = 1.0$ Kg/dm³ and kinematic viscosity $\nu = 1$ mm²/sec.
The declared NPSH values are laboratory values; for practical use we recommend increasing these values by 0,5 m.

EXAMPLE OF SPECIAL SETS
GHV30 FRAME MOUNTED HYDROVAR, DISCHARGE SIDE

EXAMPLE OF SPECIAL SETS
GHV30 FRAME MOUNTED HYDROVAR, SUCTION SIDE

EXAMPLE OF SPECIAL SETS
GHV20 HYDROVAR HV 3.30

EXAMPLE OF SPECIAL SETS
GHV30 HYDROVAR HV 3.30

ACCESSORIES

DIAPHRAGM TANKS

The booster sets are ready for installation, directly on the manifold, of 24-litre diaphragm tanks, one for each pump. The sets are also equipped with caps to close off the unused couplings. Larger tanks can also be connected to the unused end of the discharge manifold. For proper sizing of the tank please refer to the technical appendix.
Kit featuring the following accessories are **available on request**:
– diaphragm tank;
– on-off ball valve;
– operating instructions;
– packaging.

DIAPHRAGM TANK KIT

Volume	PN	DIMENSIONS (mm)			Materials		
Litres	bar	ø A	B	Valve	Diaphragm	Vessel	Valve
8	8	205	390	1" FF	EPDM	Painted steel	Nickel-plated brass
24	8	270	555	1" FF	EPDM	Painted steel	Nickel-plated brass
24	10	270	555	1" FF	EPDM	Painted steel	Nickel-plated brass
24	16	270	555	1" FF	EPDM	Painted steel	Nickel-plated brass
24	10	270	485	1" FF	Butyl	Stainless steel	AISI 316 Stainless steel

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COUNTERFLANGE KIT

Manufolds up to 3" in diameter are usually supplied with threaded couplings and caps on unused end.
Counterflange coupling kits made of zinc-plated or stainless steel are available on request.
The counterflange kits are equipped with:
- threaded flange.
- gasket and bolts/screws.
- threaded counterflange (weld-on type for 3" diameter).

THREADED COUNTERFLANGES

KIT			DIMENSIONS (mm)				HOLES		
TYPE	DN	ø C	ø A	B	ø D	H	ø F	N°	PN
2"	50	Rp 2	125	16	165	24	18	4	25
2" ½	65	Rp 2 ½	145	16	185	23	18	4	16
3"	80	Rp 3	160	17	200	27	18	8	16

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WELD-ON COUNTERFLANGES

KIT			DIMENSIONS (mm)			HOLES		
TYPE	DN	ø C	ø A	B	ø D	ø F	N°	PN
2"	50	61	125	19	165	18	4	16
2"1/2	65	77	145	20	185	18	4	16
3"	80	90	160	20	200	18	8	16

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KIT RUBBER EXPANTION JOINT

The anti-vibrating joints or compensation joints can be used in order to absorb deformations, expansions, noises in the piping and to reduced ram blows. Moreover they can resist a high degree of empty that allows the absorption of negative expansions for depression.
Being of elastic material it can be become deformed and be dilated facilitating therefore the installation, that it becomes simpler and fast, also in which the piping they are not aligned. It does not need assembly joints.

TABELLA 1 TABLE 1		L	A-B-C-D non possono essere sommati A-B-C-D can not be cumulative			
GIUNTI ELASTICI RUBBER EXPANSION JOINT			A COMPRESSIONE COMPRESSION	B ESTENSIONE EXTENSION	C SPOSTAMENTO TRANSVERSE	D FLESSIONE ANGOLARE ANGULAR MOVEMENT
DN		mm	mm	mm	mm	(°)
32	1"1/4	95	8	4	8	15
40	1"1/2	95	8	4	8	15
50	2"	105	8	5	8	15
65	2"1/2	115	12	6	10	15
80	3"	130	12	6	10	15
100	4"	135	18	10	12	15
125	5"	170	18	10	12	15
150	6"	180	18	10	12	15
200	8"	205	25	14	22	15
250	10"	240	25	14	22	15
300	12"	260	25	14	22	15
350	14"	265	25	16	22	15
400	16"	265	25	16	22	15
450	18"	265	25	16	22	15
500	20"	265	25	16	22	15

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VIBRATION DAMPERS

TYPE	SHORE	DIMENSIONS (mm)			
		ø A	H	L	M
VIBRATION DAMPER P20X20	60	20	20	18	6
VIBRATION DAMPER P40X30	60	40	30	23	8
VIBRATION DAMPER P100X50	60	100	50	50	16

Note: Available versions M/F and F/F

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DRY RUNNING PROTECTION SYSTEMS

Dry run shutdown systems should be installed to protect the pumps in case of insufficient water supply.

FLOAT SWITCH PROTECTION METHOD

The float switch protection system is used when the water supply comes from open tanks. A float switch immersed in the tank can be connected directly to the frequency converter (GHV10 sets) or to the electrical panel for the GHV20, 30 and 40 sets. If the water supply is insufficient, the float switch opens the electric contact and the pumps stop running.

ELECTRODE PROBE PROTECTION METHOD

The electrode probe protection system is used when the water supply comes from open tanks or wells. A set of three probes is connected directly to the electrical panel with control circuit (for GHV20, 30 and 40 sets).
For single-pump sets (GHV10), an additional level control must be installed (probe module) which supplies an electric contact to be connected to the frequency converter.
If the water supply is insufficient, the control circuit opens the electric contact and the pumps stop running.

MINIMUM PRESSURE SWITCH PROTECTION METHOD

The minimum pressure switch protection system is used when the water supply comes from water networks or pressurized tanks. The pressure switch is connected to the electrical panel equipped with control circuit (for GHV20, 30 and 40 sets).
For single-pump sets (GHV10) the pressure switch is connected directly to the frequency converter.
If the water supply is insufficient, the pressure switch opens the electric contact and the pumps stop running.

OPTOELECTRONIC SENSOR PROTECTION METHOD (ONLY GHV)

The optoelectronic sensor protection system is used to protect the pump by installing a sensor directly on the body of each pump.The device is mounted onto the fill plug using an adapter, if needed.
The sensor is electrically connected to the frequency converter which powers it.
The sensor cuts in if the water supply is insufficient or if there is air in the area of the pump body where it is positioned. For installations where lack of water is a normal condition when the pump is off, the control system must be equipped with a “pump running” electric contact.

TECHNICAL APPENDIX

WATER REQUIREMENTS IN CIVIL USERS

Determination of the water requirement depends on the type of users and contemporaneity factor. The calculation may be subject to regulations, standards or customs that may vary from country to country. The calculation method shown below is an example based on practical experience, designed to provide a reference value and not a substitute for detailed analytical calculation.

Water requirements in condominiums

The **consumption table** shows the maximum values for each delivery point, depending on the plumbing amenities.

MAXIMUM CONSUMPTION FOR EACH DELIVERY POINT

TYPE	CONSUMPTION (l/min)
Sink	9
Dishwasher	10
Washing machine	12
Shower	12
Bathtub	15
Washbasin	6
Bidet	6
Flush tank WC	6
Controlled flushing system WC	90

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The **sum of the water consumption values** of each delivery point determines the maximum theoretical requirement, which must be reduced according to the **contemporaneity coefficient**, because in actual fact the delivery points are never used all together.

$$f = \frac{1}{\sqrt{(0{,}857 \times Nr \times Na)}}$$ Coefficient for apartments with one bathroom and flush tank WC

$$f = \frac{1}{\sqrt{(0{,}857 \times Nr \times Na)}}$$ Coefficient for apartments with one bathroom and controlled flushing system WC

$$f = \frac{1{,}03}{\sqrt{(0{,}545 \times Nr \times Na)}}$$ Coefficient for apartments with two bathrooms and flush tank WC

$$f = \frac{0{,}8}{\sqrt{(0{,}727 \times Nr \times Na)}}$$ Coefficient for apartments with two bathrooms and controlled flushing system WC

f= coefficient; Nr= number of delivery points; Na= number of apartments

The **table of water requirements in civil users** shows the maximum contemporaneity flow-rate values based on the **number of apartments** and the type of WC for apartments with one bathroom and two bathrooms. As regards apartments with one bathroom, 7 drawing points have been taken into consideration, while 11 points have been considered for apartments with two bathrooms. If the number of drawing points or apartments is different, use the formulas to **calculate** the requirement.

TABLE OF WATER REQUIREMENTS IN CIVIL USERS

NUMBER OF APARTMENTS	WITH FLUSH TANK WC		WITH CONTROLLED FLUSHING SYSTEM WC	
	1	2	1	2
	FLOW RATE (l/min)			
1	32	40	60	79
2	45	56	85	111
3	55	68	105	136
4	63	79	121	157
5	71	88	135	176
6	78	97	148	193
7	84	105	160	208
8	90	112	171	223
9	95	119	181	236
10	100	125	191	249
11	105	131	200	261
12	110	137	209	273
13	114	143	218	284
14	119	148	226	295
15	123	153	234	305
16	127	158	242	315
17	131	163	249	325
18	134	168	256	334
19	138	172	263	343
20	142	177	270	352
21	145	181	277	361
22	149	185	283	369
23	152	190	290	378
24	155	194	296	386
25	158	198	302	394
26	162	202	308	401
27	165	205	314	409
28	168	209	320	417
29	171	213	325	424
30	174	217	331	431
35	187	234	357	466
40	200	250	382	498
45	213	265	405	528
50	224	280	427	557
55	235	293	448	584
60	245	306	468	610
65	255	319	487	635
70	265	331	506	659
75	274	342	523	682
80	283	354	540	704
85	292	364	557	726
90	301	375	573	747
95	309	385	589	767
100	317	395	604	787
120	347	433	662	863
140	375	468	715	932
160	401	500	764	996
180	425	530	811	1056
200	448	559	854	1114

For seaside resorts, a flow rate increased by at least 20% must be considered.

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WATER REQUIREMENTS FOR COMMUNITY BUILDINGS

The requirements of buildings intended for specific uses, such as **offices, residential units, hotels, department stores, nursing homes** and so on, are different from those of condominiums, and both their global daily water consumption and the maximum contemporaneity flow rate are usually greater. The **diagram of water requirements for community buildings** shows the maximum contemporaneity flow rate of some types of communities, for guidance.
These requirements must be determined case by case with the utmost accuracy, using analytical calculation methods, according to particular needs and local provisions.

For seaside resorts, the flow rate must be increased by at least 20%.

1= Offices (N. of people)
2= Department stores (N. of people)
3= Nursing homes (N. of beds)
4= Hotels, residences (N. of beds)

USE OF BOOSTER SET

Water is usually delivered by public supply systems and the pressure is generally sufficient for the proper operation of the users' water and sanitary equipment.

When this pressure is not sufficient, booster sets are employed to increase water pressure and ensure an acceptable minimum value at the furthest points. Therefore, the water supply to a building, group of buildings or to a system in general can be considered satisfactory when all the user points can deliver the required quantity of water.

Set connection methods (intake side)

Water can be supplied to a booster set in two ways:

1 - By installing a water storage tank between the user's offtake and the booster set (indirect connection, fig. 7.1.1).

2 - By connecting the booster set directly between the user's offtake and the system (direct connection, fig. 7.1.1).

The indirect connection does not allow the water system pressure to be utilized. Therefore, it requires pumps with greater head.

IThe direct connection allows the water system pressure to be utilized, provided the pressure fluctuation (Δp) does not exceed 1 bar.

If it does, a pressure reducer must be installed for proper operation of the booster set.

(1) BY PIPE UNDER PRESSURE WE MEAN A WATER SYSTEM, A CLOSED TANK, ETC.
(2) IN THE CASE OF A WATER SYSTEM INSTALL A CHECK VALVE (A) OR A DISCONNECTING DEVICE (B), UNLESS OTHERWISE PROVIDED BY LOCAL REGULATIONS

fig. 7.1.1

Water supply systems in civil buildings

The configuration of the supply system must comply with the following conditions:

- The minimum pressure ensuring the proper operation of the equipment must be guaranteed at the most unfavourable drawing point (1.5 bar for valves and flush tank WC, and 2 bar for controlled flushing system WC).
- At the most favourable drawing point, pressure must not exceed 5 bar.

Once these parameters have been satisfied, in relation to the height of the building and to the set intake conditions, the water supply system can have one of the following configurations:

A) THE SET SERVES THE ENTIRE BUILDING

fig. 7.1.2

B) THE SET SERVES THE ENTIRE BUILDING, BUT THE LOWER FLOORS ARE CONNECTED THROUGH A PRESSURE REDUCER SINCE THE PRESSURE TO THE NEAREST UTILIZATION POINTS IS TOO HIGH

fig. 7.1.3

C) THE SET SERVES THE UPPER FLOORS, WHEREAS THE LOWER FLOORS ARE SUPPLIED BY THE WATER PIPE UNDER PRESSURE

fig. 7.1.4

D) THIS CASE RESEMBLES THE PREVIOUS ONE EXCEPT THAT PRESSURE REDUCERS NEED TO BE INSTALLED ON SOME OF THE LOWER FLOORS

fig. 7.1.5

DETERMINING THE HEAD OF THE SET AND INTAKE CONDITIONS

Level intake

The delivery head of the set (H tot) is the sum of:

- He : geodetic difference in level between the set and the furthest delivery point.
- Hc : flow resistance along all the pipes and through other system components, such as valves, filters, etc..
- Hr : pressure required at the most unfavourable point.

H tot = He+Hc+Hr

Intake with positive head

In this case, the necessary delivery head (H tot) will be reduced by the inlet pressure value (Hi).

H tot = He+Hc+Hr- Hi

Intake with negative head

When the pumps suck from an underground tank or well, the necessary head will be increased by the value of the intake height (Ha):.

H tot = He+Hc+Hr+ Ha

In this case the intake height must be considered very carefully, bearing in mind that an excessive difference in level between the water storage tank and the set, or the wrong sizing of the intake pipe, can have adverse effects on pump operation, such as cavitation and unpriming.

NPSH

The minimum operating values that can be reached at the pump suction end are limited by the onset of cavitation.

Cavitation is the formation of vapour-filled cavities within liquids where the pressure is locally reduced to a critical value, or where the local pressure is equal to, or just below the vapour pressure of the liquid.

The vapour-filled cavities flow with the current and when they reach a higher pressure area the vapour contained in the cavities condenses. The cavities collide, generating pressure waves that are transmitted to the walls. These, being subjected to stress cycles, gradually become deformed and yield due to fatigue. This phenomenon, characterized by a metallic noise produced by the hammering on the pipe walls, is called incipient cavitation.

The damage caused by cavitation may be magnified by electrochemical corrosion and a local rise in temperature due to the plastic deformation of the walls. The materials that offer the highest resistance to heat and corrosion are alloy steels, especially austenitic steel. The conditions that trigger cavitation may be assessed by calculating the total net suction head, referred to in technical literature with the acronym NPSH (Net Positive Suction Head).

The NPSH represents the total energy (expressed in m.) of the liquid measured at suction under conditions of incipient cavitation, excluding the vapour pressure (expressed in m.) that the liquid has at the pump inlet.

To find the static height hz at which to install the machine under safe conditions, the following formula must be verified:

$$h_p + h_z \geq (NPSHr + 0.5) + h_f + h_{pv} \quad ①$$

where:

h_p is the absolute pressure applied to the free liquid surface in the suction tank, expressed in m. of liquid; hp is the quotient between the barometric pressure and the specific weight of the liquid.

h_z is the suction lift between the pump axis and the free liquid surface in the suction tank, expressed in m.; hz is negative when the liquid level is lower than the pump axis.

h_f is the flow resistance in the suction line and its accessories, such as: fittings, foot valve, gate valve, elbows, etc.

h_{pv} is the vapour pressure of the liquid at the operating temperature, expressed in m. of liquid. hpv is the quotient between the Pv vapour pressure and the liquid's specific weight.

0.5 is the safety factor.

The maximum possible suction head for installation depends on the value of the atmospheric pressure (i.e. the elevation above sea level at which the pump is installed) and the temperature of the liquid.

To help the user, with reference to water temperature (4°C) and to the elevation above sea level, the following tables show the drop in hydraulic pressure head in relation to the elevation above sea level, and the suction loss in relation to temperature.

Water temperature (°C)	20	40	60	80	90	110	120
Suction loss (m)	0,2	0,7	2,0	5,0	7,4	15,4	21,5

Elevation above sea level (m)	500	1000	1500	2000	2500	3000
Suction loss (m)	0,55	1,1	1,65	2,2	2,75	3,3

Flow resistance is shown in the tables at pages 111-112 of this catalogue. To reduce it to a minimum, especially in cases of high suction head (over 4-5 m.) or within the operating limits with high flow rates, we recommend using a suction line having a larger diameter than that of the pump's suction port.
It is always a good idea to position the pump as close as possible to the liquid to be pumped.

Make the following calculation:

Liquid: water at ~ 15°C $\gamma = 1$ kg/dm³
Flow rate required: 10 m³/h
Head for required delivery: 51 m.
Suction lift: 4,5 m.
The selection is an SV805 pump whose NPSH required value is, at 10 m³/h, 1.2 m.

For water at 15°C

$$h_p = \frac{Pa}{\gamma} = 10{,}33\text{m}, \quad h_{pv} = \frac{Pv}{\gamma} = 0{,}174 \text{ m } (0.01701 \text{ bar})$$

The H_f flow resistance in the suction line with foot valves is ~ 2 m.
By substituting the parameters in formula (1) with the numeric values above, we have:

$$10{,}33 + (-4{,}5) \geq (1{,}2 + 0{,}5) + 2 + 0{,}17$$

from which we have 5,8 > 3,9

The relation is therefore verified.

TECHNICAL APPENDIX VAPOUR PRESSURE PS VAPOUR PRESSURE AND ρ DENSITY OF WATER TABLE

t	T	ps	ρ
°C	K	bar	kg/dm³
0	273,15	0,00611	0,9998
1	274,15	0,00657	0,9999
2	275,15	0,00706	0,9999
3	276,15	0,00758	0,9999
4	277,15	0,00813	1,0000
5	278,15	0,00872	1,0000
6	279,15	0,00935	1,0000
7	280,15	0,01001	0,9999
8	281,15	0,01072	0,9999
9	282,15	0,01147	0,9998
10	283,15	0,01227	0,9997
11	284,15	0,01312	0,9997
12	285,15	0,01401	0,9996
13	286,15	0,01497	0,9994
14	287,15	0,01597	0,9993
15	288,15	0,01704	0,9992
16	289,15	0,01817	0,9990
17	290,15	0,01936	0,9988
18	291,15	0,02062	0,9987
19	292,15	0,02196	0,9985
20	293,15	0,02337	0,9983
21	294,15	0,24850	0,9981
22	295,15	0,02642	0,9978
23	296,15	0,02808	0,9976
24	297,15	0,02982	0,9974
25	298,15	0,03166	0,9971
26	299,15	0,03360	0,9968
27	300,15	0,03564	0,9966
28	301,15	0,03778	0,9963
29	302,15	0,04004	0,9960
30	303,15	0,04241	0,9957
31	304,15	0,04491	0,9954
32	305,15	0,04753	0,9951
33	306,15	0,05029	0,9947
34	307,15	0,05318	0,9944
35	308,15	0,05622	0,9940
36	309,15	0,05940	0,9937
37	310,15	0,06274	0,9933
38	311,15	0,06624	0,9930
39	312,15	0,06991	0,9927
40	313,15	0,07375	0,9923
41	314,15	0,07777	0,9919
42	315,15	0,08198	0,9915
43	316,15	0,09639	0,9911
44	317,15	0,09100	0,9907
45	318,15	0,09582	0,9902
46	319,15	0,10086	0,9898
47	320,15	0,10612	0,9894
48	321,15	0,11162	0,9889
49	322,15	0,11736	0,9884
50	323,15	0,12335	0,9880
51	324,15	0,12961	0,9876
52	325,15	0,13613	0,9871
53	326,15	0,14293	0,9862
54	327,15	0,15002	0,9862

t	T	ps	ρ
°C	K	bar	kg/dm³
55	328,15	0,15741	0,9857
56	329,15	0,16511	0,9852
57	330,15	0,17313	0,9846
58	331,15	0,18147	0,9842
59	332,15	0,19016	0,9837
60	333,15	0,1992	0,9832
61	334,15	0,2086	0,9826
62	335,15	0,2184	0,9821
63	336,15	0,2286	0,9816
64	337,15	0,2391	0,9811
65	338,15	0,2501	0,9805
66	339,15	0,2615	0,9799
67	340,15	0,2733	0,9793
68	341,15	0,2856	0,9788
69	342,15	0,2984	0,9782
70	343,15	0,3116	0,9777
71	344,15	0,3253	0,9770
72	345,15	0,3396	0,9765
73	346,15	0,3543	0,9760
74	347,15	0,3696	0,9753
75	348,15	0,3855	0,9748
76	349,15	0,4019	0,9741
77	350,15	0,4189	0,9735
78	351,15	0,4365	0,9729
79	352,15	0,4547	0,9723
80	353,15	0,4736	0,9716
81	354,15	0,4931	0,9710
82	355,15	0,5133	0,9704
83	356,15	0,5342	0,9697
84	357,15	0,5557	0,9691
85	358,15	0,5780	0,9684
86	359,15	0,6011	0,9678
87	360,15	0,6249	0,9671
88	361,15	0,6495	0,9665
89	362,15	0,6749	0,9658
90	363,15	0,7011	0,9652
91	364,15	0,7281	0,9644
92	365,15	0,7561	0,9638
93	366,15	0,7849	0,9630
94	367,15	0,8146	0,9624
95	368,15	0,8453	0,9616
96	369,15	0,8769	0,9610
97	370,15	0,9094	0,9602
98	371,15	0,9430	0,9596
99	372,15	0,9776	0,9586
100	373,15	1,0133	0,9581
102	375,15	1,0878	0,9567
104	377,15	1,1668	0,9552
106	379,15	1,2504	0,9537
108	381,15	1,3390	0,9522
110	383,15	1,4327	0,9507
112	385,15	1,5316	0,9491
114	387,15	1,6362	0,9476
116	389,15	1,7465	0,9460
118	391,15	1,8628	0,9445

t	T	ps	ρ
°C	K	bar	kg/dm³
120	393,15	1,9854	0,9429
122	395,15	2,1145	0,9412
124	397,15	2,2504	0,9396
126	399,15	2,3933	0,9379
128	401,15	2,5435	0,9362
130	403,15	2,7013	0,9346
132	405,15	2,867	0,9328
134	407,15	3,041	0,9311
136	409,15	3,223	0,9294
138	411,15	3,414	0,9276
140	413,15	3,614	0,9258
145	418,15	4,155	0,9214
155	428,15	5,433	0,9121
160	433,15	6,181	0,9073
165	438,15	7,008	0,9024
170	433,15	7,920	0,8973
175	448,15	8,924	0,8921
180	453,15	10,027	0,8869
185	458,15	11,233	0,8815
190	463,15	12,551	0,8760
195	468,15	13,987	0,8704
200	473,15	15,550	0,8647
205	478,15	17,243	0,8588
210	483,15	19,077	0,8528
215	488,15	21,060	0,8467
220	493,15	23,198	0,8403
225	498,15	25,501	0,8339
230	503,15	27,976	0,8273
235	508,15	30,632	0,8205
240	513,15	33,478	0,8136
245	518,15	36,523	0,8065
250	523,15	39,776	0,7992
255	528,15	43,246	0,7916
260	533,15	46,943	0,7839
265	538,15	50,877	0,7759
270	543,15	55,058	0,7678
275	548,15	59,496	0,7593
280	553,15	64,202	0,7505
285	558,15	69,186	0,7415
290	563,15	74,461	0,7321
295	568,15	80,037	0,7223
300	573,15	85,927	0,7122
305	578,15	92,144	0,7017
310	583,15	98,70	0,6906
315	588,15	105,61	0,6791
320	593,15	112,89	0,6669
325	598,15	120,56	0,6541
330	603,15	128,63	0,6404
340	613,15	146,05	0,6102
350	623,15	165,35	0,5743
360	633,15	186,75	0,5275
370	643,15	210,54	0,4518
374,15	647,30	221,20000	0,3154

G-at_npsh_a_sc

CHOOSING AND SIZING THE SURGE TANK

The purpose of the surge tank is to limit the number of hourly starts of the pumps, placing part of its stock of water, which is maintained under pressure by the air above it, at the disposal of the system.

The surge tank can be of the air cushion or diaphragm type.

In the air cushion version there is no clear separation between air and water. Since part of the air tends to mix with water, it is necessary to restore it by means of air supply units or a compressor.

In the diaphragm version, neither air supply units nor compressor are needed, as contact between air and water is prevented by a flexible diaphragm inside the tank.

The following method, which is used to determine the volume of a surge tank, is valid both for horizontal and vertical surge tanks.

When calculation the volume of the surge tank, it is generally sufficient to consider the first pump only.

DIAPHRAGM TANK

If you decide to use a diaphragm tank, the volume will be lower than that of the air-cushion tank. It can be calculated with the following formula:

$$Vm = \frac{Qp}{4 \times Z} \times \frac{1}{1 - \frac{(Pmin - 2)}{Pmax}}$$

where:

Vm = Total volume of the air-cushion surge tank in m^3
Qp = Average pump flow rate in m^3/h
Pmax = Maximum pressure setting (wcm)
Pmin = Minimum pressure setting (wcm)
Z = Maximum number of starts per hour allowed by the motor

Example:

CN 32 - 160/22 pump
Pmax = 32 mca
Pmin = 22 mca
Qp = 18 m^3/h
Z = 30

$$Vm = \frac{Qp}{4 \times Z} \times \frac{1}{1 - \frac{(Pmin - 2)}{Pmax}} = 0{,}4\ m^3$$

A 500-litre surge tank is therefore required.

TABLE OF FLOW RESISTANCE IN 100 m OF STRAIGHT CAST IRON PIPELINE (HAZEN-WILLIAMS FORMULA C=100)

FLOW RATE			NOMINAL DIAMETER in mm and INCHES																
m^3/h	l/min		15	20	25	32	40	50	65	80	100	125	150	175	200	250	300	350	400
			1/2"	3/4"	1"	1 1/4"	1 1/2"	2	2 1/2"	3"	4"	5"	6"	7"	8"	10"	12"	14"	16"
0,6	10	v	0,94	0,53	0,34	0,21	0,13												
		hr	16	3,94	1,33	0,40	0,13												
0,9	15	v	1,42	0,80	0,51	0,31	0,20												
		hr	33,9	8,35	2,82	0,85	0,29												
1,2	20	v	1,89	1,06	0,68	0,41	0,27	0,17											
		hr	57,7	14,21	4,79	1,44	0,49	0,16											
1,5	25	v	2,36	1,33	0,85	0,52	0,33	0,21											
		hr	87,2	21,5	7,24	2,18	0,73	0,25											
1,8	30	v	2,83	1,59	1,02	0,62	0,40	0,25											
		hr	122	30,1	10,1	3,05	1,03	0,35											
2,1	35	v	3,30	1,86	1,19	0,73	0,46	0,30											
		hr	162	40,0	13,5	4,06	1,37	0,46											
2,4	40	v		2,12	1,36	0,83	0,53	0,34	0,20										
		hr		51,2	17,3	5,19	1,75	0,59	0,16										
3	50	v		2,65	1,70	1,04	0,66	0,42	0,25										
		hr		77,4	26,1	7,85	2,65	0,89	0,25										
3,6	60	v		3,18	2,04	1,24	0,80	0,51	0,30										
		hr		108	36,6	11,0	3,71	1,25	0,35										
4,2	70	v		3,72	2,38	1,45	0,93	0,59	0,35										
		hr		144	48,7	14,6	4,93	1,66	0,46										
4,8	80	v		4,25	2,72	1,66	1,06	0,68	0,40										
		hr		185	62,3	18,7	6,32	2,13	0,59										
5,4	90	v			3,06	1,87	1,19	0,76	0,45	0,30									
		hr			77,5	23,3	7,85	2,65	0,74	0,27									
6	100	v			3,40	2,07	1,33	0,85	0,50	0,33									
		hr			94,1	28,3	9,54	3,22	0,90	0,33									
7,5	125	v			4,25	2,59	1,66	1,06	0,63	0,41									
		hr			142	42,8	14,4	4,86	1,36	0,49									
9	150	v				3,11	1,99	1,27	0,75	0,50	0,32								
		hr				59,9	20,2	6,82	1,90	0,69	0,23								
10,5	175	v				3,63	2,32	1,49	0,88	0,58	0,37								
		hr				79,7	26,9	9,07	2,53	0,92	0,31								
12	200	v				4,15	2,65	1,70	1,01	0,66	0,42								
		hr				102	34,4	11,6	3,23	1,18	0,40								
15	250	v				5,18	3,32	2,12	1,26	0,83	0,53	0,34							
		hr				154	52,0	17,5	4,89	1,78	0,60	0,20							
18	300	v					3,98	2,55	1,51	1,00	0,64	0,41							
		hr					72,8	24,6	6,85	2,49	0,84	0,28							
24	400	v					5,31	3,40	2,01	1,33	0,85	0,54	0,38						
		hr					124	41,8	11,66	4,24	1,43	0,48	0,20						
30	500	v					6,63	4,25	2,51	1,66	1,06	0,68	0,47						
		hr					187	63,2	17,6	6,41	2,16	0,73	0,30						
36	600	v						5,10	3,02	1,99	1,27	0,82	0,57	0,42					
		hr						88,6	24,7	8,98	3,03	1,02	0,42	0,20					
42	700	v						5,94	3,52	2,32	1,49	0,95	0,66	0,49					
		hr						118	32,8	11,9	4,03	1,36	0,56	0,26					
48	800	v						6,79	4,02	2,65	1,70	1,09	0,75	0,55					
		hr						151	42,0	15,3	5,16	1,74	0,72	0,34					
54	900	v						7,64	4,52	2,99	1,91	1,22	0,85	0,62					
		hr						188	52,3	19,0	6,41	2,16	0,89	0,42					
60	1000	v							5,03	3,32	2,12	1,36	0,94	0,69	0,53				
		hr							63,5	23,1	7,79	2,63	1,08	0,51	0,27				
75	1250	v							6,28	4,15	2,65	1,70	1,18	0,87	0,66				
		hr							96,0	34,9	11,8	3,97	1,63	0,77	0,40				
90	1500	v							7,54	4,98	3,18	2,04	1,42	1,04	0,80				
		hr							134	48,9	16,5	5,57	2,29	1,08	0,56				
105	1750	v							8,79	5,81	3,72	2,38	1,65	1,21	0,93				
		hr							179	65,1	21,9	7,40	3,05	1,44	0,75				
120	2000	v								6,63	4,25	2,72	1,89	1,39	1,06	0,68			
		hr								83,3	28,1	9,48	3,90	1,84	0,96	0,32			
150	2500	v								8,29	5,31	3,40	2,36	1,73	1,33	0,85			
		hr								126	42,5	14,3	5,89	2,78	1,45	0,49			
180	3000	v									6,37	4,08	2,83	2,08	1,59	1,02	0,71		
		hr									59,5	20,1	8,26	3,90	2,03	0,69	0,28		
210	3500	v									7,43	4,76	3,30	2,43	1,86	1,19	0,83		
		hr									79,1	26,7	11,0	5,18	2,71	0,91	0,38		
240	4000	v									8,49	5,44	3,77	2,77	2,12	1,36	0,94		
		hr									101	34,2	14,1	6,64	3,46	1,17	0,48		
300	5000	v										6,79	4,72	3,47	2,65	1,70	1,18		
		hr										51,6	21,2	10,0	5,23	1,77	0,73		
360	6000	v										8,15	5,66	4,16	3,18	2,04	1,42		
		hr										72,3	29,8	14,1	7,33	2,47	1,02		
420	7000	v											6,61	4,85	3,72	2,38	1,65	1,21	
		hr											39,6	18,7	9,75	3,29	1,35	0,64	
480	8000	v											7,55	5,55	4,25	2,72	1,89	1,39	
		hr											50,7	23,9	12,49	4,21	1,73	0,82	
540	9000	v											8,49	6,24	4,78	3,06	2,12	1,56	1,19
		hr											63,0	29,8	15,5	5,24	2,16	1,02	0,53
600	10000	v												6,93	5,31	3,40	2,36	1,73	1,33
		hr												36,2	18,9	6,36	2,62	1,24	0,65

The hr values must be multiplied by:
0.71 for galvanized or painted steel pipes
0.54 for stainless steel or copper pipes
0.47 for PVC or PE pipes

G-at-pct_a_th

hr = flow resistance for 100m of straight pipeline (m)
V = water speed (m/s)

TABLE OF FLOW RESISTANCE IN BENDS, VALVES AND GATES

The flow resistance is calculated using the equivalent pipeline length method according to the table below:

ACCESSORY TYPE	DN											
	25	32	40	50	65	80	100	125	150	200	250	300
	Equivalent pipeline length (m)											
45° bend	0,2	0,2	0,4	0,4	0,6	0,6	0,9	1,1	1,5	1,9	2,4	2,8
90° bend	0,4	0,6	0,9	1,1	1,3	1,5	2,1	2,6	3,0	3,9	4,7	5,8
90° smooth bend	0,4	0,4	0,4	0,6	0,9	1,1	1,3	1,7	1,9	2,8	3,4	3,9
Union tee or cross	1,1	1,3	1,7	2,1	2,6	3,2	4,3	5,3	6,4	7,5	10,7	12,8
Gate	-	-	-	0,2	0,2	0,2	0,4	0,4	0,6	0,9	1,1	1,3
Non return valve	1,1	1,5	1,9	2,4	3,0	3,4	4,7	5,9	7,4	9,6	11,8	13,9

G-a-pcv_a_th

The table is valid for the Hazen Williams coefficient C = 100 (cast iron pipework). For steel pipework, multiply the values by 1.41. For stainless steel, copper and coated cast iron pipework, multiply the values by 1.85.
When the **equivalent pipeline length** has been determined, the flow resistance is obtained from the table of flow resistance.
The values given are guideline values which are bound to vary slightly according to the model, especially for gate valves and non-return valves, for which it is a good idea to check the values supplied by the manufacturers.

PERFORMANCE WITH VARYING SPEED EQUIVALENCE RELATIONS

Fitting the electric pump with a frequency converter makes it possible to vary the pump rotation speed, normally according to the system pressure parameter. **Variations in electric pump speed** result in **modified performances** according to the equivalence relations.

Flow rate $$\frac{Q1}{Q2} = \left[\frac{n1}{n2}\right]$$

Head $$\frac{H1}{H2} = \left[\frac{n1}{n2}\right]^2$$

Power $$\frac{P1}{P2} = \left[\frac{n1}{n2}\right]^3$$

n1 = initial speed; n2= speed required.
Q1 = initial flow rate; Q2= flow rate required.
H1 = initial head; H2= head required.
P1 = initial power; P2= power required

Frequency ratios can be used instead of speed in practical applications, keeping 30 Hz as the bottom limit.

Example : 2-pole 50 Hz electric pump n1 =2900 (point A)
Flow rate (A) = 100 l/min; Head (A) = 50m
By reducing the frequency to 30 Hz the speed is reduced to approx. n2 = 1740 rpm (point B)
Flow rate (B) = 60 l/min; Head (B) = 18 m
The power of the new work point B is cut to about 22% of the initial power.

SIZING THE DIAPHRAGM TANK IN SYSTEMS WITH SPEED VARIATION

Variable speed booster sets need **smaller tanks** compared to traditional systems. Generally speaking, a tank with a litre capacity of just 10% of the nominal capacity of a single pump, expressed in litres per minute, is needed. The **gradual starting** of the pumps controlled by the frequency converters reduces the need to limit the number of hourly starts; the main purpose of the tank is to compensate for small system losses, stabilize the pressure and make up for pressure variations caused by sudden demand.

Make the following calculation:
Set made up of three electric pumps, each with a maximum flow rate of 400 l/min, for a total capacity of 1200 l/min. The **volume** required for the tank is 40 litres. This size can be obtained by using two 24-litre tanks mounted directly onto the set's manifold.
The calculation establishes the minimum value needed for proper operation.

ASSESSMENT OF PROBABLE DEMAND (VALID IN U.K. ONLY)

The method adopted is based on loading unit values as detailed in the Plumbing Engineering Design Guide published by the Institute of Plumbing.

When designing a hot or cold water supply system an assessment must be made to obtain the maximum probable simultaneous demand.
Depending on the type of services being provided it rarely occurs for all the appliances to be used at the same time therefore the design usually allows for a peak usage which is less than the maximum.
Probable demand will depend on, the type of building and its use, type of appliances installed and frequency of use.
The simultaneous demand in most installations can be calculated with an adequate degree of accuracy using the loading unit concept.
The usage patterns and types of appliances in different installations will vary greatly.
Sports and Leisure centres for example are usually calculated directly by the flow rates of each appliance, without diversity factors. Each case will need to be looked at in its own right and assessed accordingly. Judgement of the designer must prevail.

Loading unit values vary for each type of appliance. A loading unit has no precise value in terms of litres per second.
See loading unit table below.
By multiplying the total number of each appliance by the appropriate loading unit number and adding the resultant totals together, the recommended flow can be read from chart.

Loading unit table

APPLIANCE	Loading Unit	Recommended Flow L/s
WC	1,5	0,12
Wash basin (hot & cold)	3	0,3
Sink (hot & cold)	6	0,4
Bath (hot & cold)	20	0,6
Shower (hot & cold)	10	0,24
Washing machine	2	0,3

g_at_a_LU

Working Example

A block of standard flats containing a total of 70 dwellings

Each standard flat is assumed to have:
1 x Hand basin hot & cold = 3 L/U x 70 = 210
1 x WC cold only = 1.5 L/U x 70 = 105
1 x Shower hot & cold = 10 L/U x 70 = 700
1 x Sink hot & cold = 6 L/U x 70 = 420

Total Loading Unit =1435

This figure can now be read from chart opposite: total flow = 8.5 L/s

ASSESSING HEAD REQUIREMENT (VALID IN U.K. ONLY)

The **head** required in a boosted cold water system consists of three components, static head, residual pressure and system friction losses. The values of these three components are added together to give the total required head at the system flow rate.

Static head (He): This is the difference between the break tank low water line and the highest discharge point in the building. If the height of the build is not known, then 2.8-3.0 metres per floor can be used to assess the building height.

Residual pressure (Hr): This is the pressure required at the highest outlet device, normally 20metres.
Note: some modern showers may require higher pressures.

System friction losses (Hc): The total losses through pipework, pipework fittings, valves, PRV's and all other equipment fed through the pumpset must be added to find the total system losses.
On conventional systems that do not include excessive runs of pipe or specialised components a rough guide would be to allow 0.05 metres friction loss for each metre of static head.

Example:
Static head (He): Building height four floors @ 2.8m each = 11.2m +
Residual pressure (Hr): Pressure at highest outlet = 20m +
Friction loses (Hc): 11.2 (static head) x 0.05 = 0.56m
Total pump head required (H) = 31.76m (3.11 Bar)

Pressure limitations

The designer must ensure that adequate precautions are taken to ensure that the system is capable of withstanding the closed valve head produced by the pump set. In cases where closed valve pressures cannot be tolerated, pressure reducing valves should be fitted down stream of the booster set.

Velocity

Pipework within the system should be sized to limit the velocity to the figures stated in table below
Higher velocities will lead to excessive noise, ware and higher running costs

PIPE SIZE	SUCTION PIPE m/s	DELIVERY PIPE m/s
Less than 80mm	0,46	0,91 to 1,07
100-150mm	0,55	1,22 to 1,52
200mm	0,76	1,68
250 and above	0,91	1,82 to 2,13

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BOOSTER SIZING

What information do we require to size a booster set?

- As a minimum we need to know:
  – The total flow rate, or information to assess this.
  – The total head at flow rate, or the height of building.
  – If the pumps are to operate under positive head, or suction lift conditions.
  – Where the set is to be sited, I.E. basement or roof.
  – Preferred choice fixed or variable speed

- Additional information if available:
  – How to split the duty for particular applications I.E. duty/standby or duty/assist.
  – The size and material of the connecting pipework.
  – Is a Jockey pump required.

ACCESSORIES

OPTICAL SENSORS

FLOAT SWITCHES

VALVES

CILINDER WATER TANK

NON-RETURN VALVES

COUPLINGS

PRESSURE SWITCHES

VOLUMETRIC CAPACITY

Litres per minute l/min	Cubic metres per hour m^3/h	Cubic feet per hour ft^3/h	Cubic feet per minute ft^3/min	Imp. gal. per minute Imp. gal/min	US gal. per minute Us gal./min
1,0000	0,0600	2,1189	0,0353	0,2200	0,2640
16,6670	1,0000	35,3147	0,5886	3,6660	4,4030
0,4720	0,0283	1,0000	0,0167	0,1040	0,1250
28,3170	1,6990	60,0000	1,0000	6,2290	7,4800
4,5460	0,2728	9,6326	0,1605	1,0000	1,2010
3,7850	0,2271	8,0209	0,1337	0,8330	1,0000
0,1100	0,0066	0,2339	0,0039	0,0240	0,0290

PRESSURE AND HEAD

Newtons per square metre N/m^2	kilopascal kPa	bar bar	Pound force per square inch psi	metre of water m H_2O	millimetre of mercury mm Hg
1,0000	0,0010	1 x 105	$1,45 \times 10^{-4}$	$1,02 \times 10^{-4}$	0,0075
1000,0000	1,0000	0,0100	0,1450	0,1020	7,5000
100000,0000	100,0000	1,0000	14,5000	10,2000	750,1000
98067,0000	98,0700	0,9810	14,2200	10,0000	735,6000
6895,0000	6,8950	0,0690	1,0000	0,7030	51,7200
2984,0000	2,9840	0,0300	0,4330	0,3050	22,4200
9789,0000	9,7890	0,0980	1,4200	1,0000	73,4200
133,3000	0,1330	0,0013	0,0190	0,0140	1,0000
3386,0000	3,3860	0,0338	0,4910	0,3450	25,4000

LENGHT

millimetre mm	centimetre cm	metre m	inch in	foot ft	yard yd
1,0000	0,1000	0,0010	0,0394	0,0033	0,0011
10,0000	1,0000	0,0100	0,3937	0,0328	0,0109
1000,0000	100,0000	1,0000	39,3701	3,2808	1,0936
25,4000	2,5400	0,0254	1,0000	0,0833	0,0278
304,8000	30,4800	0,3048	12,0000	1,0000	0,3333
914,4000	91,4400	0,9144	36,0000	3,0000	1,0000

VOLUME

cubic metre m^3	litre litre	millilitre ml	imp. gallon imp. gal.	US gallon US gal.	cubic foot ft^3
1,0000	1000,0000	1 x 106	220,0000	264,2000	35,3147
0,0010	1,0000	1000,0000	0,2200	0,2642	0,0353
1 x 10-6	0,0010	1,0000	2,2 x 10-4	2,642 x 10-4	3,53 x 10-5
0,0045	4,5460	4546,0000	1,0000	1,2010	0,1605
0,0038	3,7850	3785,0000	0,8327	1,0000	0,1337
0,0283	28,3170	28317,0000	6,2288	7,4805	1,0000

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